Dräger Multi-PID 2

Portable Photoionization Monitor

Instrument User manual
Software Version 3.nn

ST-2425-2003.eps

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For Your Safety

Strictly follow the Instructions for Use

Any use of this instrument requires a full understanding and strict adherence to these instructions.
This instrument is only to be used for the purposes specified here (see “Intended Use” on page 18).

Maintenance

The Multi-PID 2 must be inspected and serviced by trained service personnel at regular intervals.
Repair of the Multi-PID 2 may only be carried out by trained service personnel.
Only authentic Dräger Safety spare parts may be used for maintenance.
Observe chapter “Maintenance Intervals” on page 72.
We recommend that a service contract be obtained with the service of Dräger Safety and that all repairs are also carried out by them.

Use in areas subject to explosion hazards

This instrument and its components have been tested and approved according to the European Directives 94/9/ EEC (ATEX Directive) and 89/336/ EEC (The electromagnetic Compatibility Directive) and may be used only under the conditions explicitly specified in the EC Declaration of Conformity of August 28, 2003, see page 11.
Modifications of components or the use of faulty or incomplete parts is not permitted. When making repairs to equipment or components of this type, the relevant national regulations must be adhered to.

Liability for proper functioning or damage

The liability for the proper functioning of the instrument is irrevocably transferred to the owner or operator to the extent that the instrument is improperly serviced or repaired by personnel not employed or authorized by Dräger Safety or if the instrument is used in a manner not conforming to its intended use.
Dräger Safety cannot be held responsible for damage caused by non-compliance with the recommendations given above.
The warranty and liability provisions of the terms of sale and delivery of Dräger Safety are likewise not modified by the recommendations given above.

Dräger Safety AG & Co. KGaA

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Notices and Warnings

FCC Warning

This instrument has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Subpart B, Class B of Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

The Multi-PID 2 Intrinsic Safety (I/S) Notice

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The Multi-PID 2 is classified for use in class I, division 1, groups A, B, C, D hazardous locations. T4 (135 °C) rating.

It has been listed by MET Laboratories, Inc., to comply with Underwriters Laboratories® Inc. UL® 913 Standard for Intrinsically Safe Apparatus and Associated Apparatus for use in Class I, Division 1, Groups A, B, C, D Hazardous (Classified) Locations, Sixth Edition when powered by MX700010 Battery Pack.
The Multi-PID 2 is not intended to detect combustible levels of gases.
The Multi-PID 2 is classified for use in atmospheres containig combustible levels of gases.

These optional accessories may be used with the Multi-PID 2 in a hazardous location:

Name and Discription	Part No.
Calibration Regulator	68 10 688
Wrist Strap	83 17 673
Belt-Clip Holster	83 17 677
Carrying Case	83 17 664
User's Reference Card	90 23 770
Long Sample Probe	64 05 411
Short Sample Probe	64 05 412
Tube Holder	83 19 093
Dräger Tube, Carbon filter	CH 24 101
Sampling Tube (Activated Charcoal, Type BIA)	67 33 011
PID Pre-Filter Tube Benzene	81 03 511
Dräger Tube, Humidity filter	81 03 531

Do not use any other accessories with the Multi-PID 2 in a hazardous location.

Substitution of components may affect safety rating.

CAUTION:
To reduce the risk of fire or injury to persons, read and follow these instructions:

1. **All calibration, maintenance and servicing of this device, including battery charging, must be performed in a safe area away from hazardous locations. Disconnect all power before servicing.**
2. **There are no operator replaceable parts inside the Multi-PID 2 except the battery pack, UV lamp and sample inlet filter.**
3. **There are no operator serviceable parts inside the Multi-PID 2.**

WARNING:

1. **For replacement battery pack use only Part No. 83 17 670.**
2. **Do not dispose of the battery pack in a fire. The cells may explode. The battery pack must be disposed of properly. Check with local codes for possible special disposal instructions.**
3. **Do not open or mutilate the battery pack. If the Multi-PID 2 is used in a manner not specified, the protection provided by the Multi-PID 2 may be impaired.**
4. **Exercise care in handling battery packs in order not to short the terminals with conducting materials such as rings, bracelets and keys. The battery or conductor may overheat and cause burns.**
5. **Do not defeat proper polarity orientation between the battery pack and battery charger.**
6. **Charging the battery is only to be done in a nonhazardous area.**
7. **Charge the battery pack using the AC adapter provided with or identified for use with this product only in accordance with the instructions and limitations specified in this manual. For AC adapter use only Part No. 64 05 428 (115 Volt AC), Part No. 83 17 661 (220 Volt AC). When using the AC adapter do not block access to AC outlet in use with adapter. AC adapter is not to be used in a hazardous area.**

ATEX Directive and EMC Directive

Dräger
SAFETY

EC Declaration of Conformity

We **Dräger Safety AG & Co.KGaA**
Revalstraße 1
23560 Lübeck, Germany

declare that: Equipment **Photoionization Monitor**

Model name **Multi-PID 2**

in accordance with the following Directives:

94/9/EEC **ATEX Directive**

89/336/EEC **The Electromagnetic Compatibility Directive**

has been designed and manufactured to the following standards:

Safety: **EN61010-1:2001**

EMC: **EN61326:1997:A1:1998 and A2:2001**

Explosive Atmosphere: **EN50014:1998 and EN50020:2002**

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced standards and all essential requirements of the Directives.

Signed by:

H.O. Sluma

Name: Dr. Heinz-Dieter Sluma
Title: President Business Unit Gas Detection Technology
Germany, 23560 Lübeck, Revalstraße 1
On August 28, 2003

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Model: Multi-PID 2 Photoionization Monitor
Certified Intrinsically Safe/Securite Intrinséque.
Class I, Division 1, Groups A B C and D.
Maximum surface temperature 135°C T4.

Model: Multi-PID 2 CE 0158 Ex II 2G
TRL: 03ATEX21031X
EEx ib IIC T4 (Ta = 0°C to +40°C)
Dräger Safety, D23560 Lübeck, Germany

WARNING - Substitution of components may impair intrinsic safe. Avertissement - La substitution de composants peut compromettre la securite intrinsique. To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. CAUTION - To reduce the risk of explosion, only use AC Adapter and Serial Port or recharge the batteries outside of the hazardous location. Avertissement - Afin de prevenir l'inflammation d'atmosphères dangereuses, ne charger les batteries que dans des emplacements designes non dangereux. Use only Dräger battery pack Part No. 8317670.

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WARNING

1. *All calibration, maintenance and servicing of this device, including battery charging, must be performed in a safe area away from hazardous locations.*

2. *Disconnect all power before servicing.*

3. *Do not open UV Lamp Cap when unit is energized.*

4. *Only use the AC Adapter in a safe area away from hazardous locations*

5. *Only use the Serial Port in a safe area away from hazardous locations.*

CAUTION

To reduce the risk of fire or injury to persons, read and follow these instructions:

1. *There are no operator replaceable parts inside the Multi-PID 2 except the battery pack, UV lamp and sample inlet filter.*

2. *For replacement battery pack use only Dräger Part No. 83 17 670.*

3. *There are no operator serviceable parts inside the Multi-PID 2.*

4. *Do not dispose of the battery pack in a fire. The cells may explode. The battery pack must be disposed of properly. Check with local codes for possible special disposal instructions.*

5. *Do not open or mutilate the battery pack. If the Multi-PID 2 is used in a manner not specified, the protection provided by the Multi-PID 2 may be impaired.*

6. *Exercise care in handling battery packs in order not to short the terminals with conducting materials such as rings, bracelets and keys. The battery or conductor may overheat and cause burns.*

7. *Do not defeat proper polarity orientation between the battery pack and battery charger.*

8. *Charge the battery pack using the AC adapter provided with or identified for use with this product only in accordance with the instructions and limitations specified in this manual. For AC adapter use only Part No. 64 05 428 (115 Volt AC), Part No. 83 17 661 (220 Volt AC)). When using the AC adapter do not block access to AC outlet in use with adapter. AC adapter is not to be used in a hazardous area.*

These optional accessories may be used with the Multi-PID 2 in a hazardous location:

Name and Discription	**Part No.**
Calibration Regulator	68 10 688
Wrist Strap	83 17 673
Belt-Clip Holster	83 17 677
Carrying Case	83 17 664
User's Reference Card	90 23 770
Long Sample Probe	64 05 411
Short Sample Probe	64 05 412
Tube Holder	83 19 093
Dräger Tube, Carbon filter	CH 24 101
Sampling Tube (Activated Charcoal, Type BIA)	67 33 011
PID Pre-Filter Tube Benzene	81 03 511
Dräger Tube, Humidity filter	81 03 531

Do not use any other accessories with the Multi-PID 2 in a hazardous location.

Introduction

About this Manual

This manual provides detailed instructions for setup, operation and maintenance of the Multi-PID 2 Portable Photoionization Monitor.

Before unpacking the instrument, please read Warnings and Safety Practices. This section describes possible hazards that might injure the user, damage the instrument or compromise its operation. Some general safety information is also provided.

To help you learn to use the Multi-PID 2 quickly, this manual is organized by tasks beginning with:

- Using the Multi-PID 2 in “Using the Multi-PID 2” on page 25.
- Accessories are covered in “Connecting Accessories” on page 43.
- Routine maintenance is covered in “Routine Maintenance” on page 71.
- Troubleshooting techniques are covered in “Troubleshooting” on page 87.

The Multi-PID 2 manual uses a few conventions for key names on the keypad and for text that is shown on the display.

» Display Text «
Texts shown on the Multi-PID 2 display are written with quotation marks, e.g. **» Enter current time «**.

The names of soft keys are also written with quotation marks, e.g. **" select "**.

In the text you will find various warnings and notes.

WARNING:
A warning indicates an operation that could cause personal injury if precautions are not followed.

CAUTION:
A caution indicates an operation that could cause instrument damage if precautions are not followed.

NOTE:
A note indicates significant information.

Warnings and Safety Practices

Please read the Notices and Warnings section of this user's manual before operating the Multi-PID 2.

Approved Models of the Multi-PID 2

This manual provides operational information for all models of the Multi-PID 2. The Multi-PID 2 is intrinsically safe and approved for use in hazardous locations. Refer to the Notices and Warnings section of this manual for details of each approval.

Throughout the manual, notes are provided to inform you of any limitations of usage for the Multi-PID 2 models.

WARNING:
If the Multi-PID 2 you are using is not specifically identified as intrinsically safe with a label on the Multi-PID 2, do not use it in a location where flammable concentrations of gases and vapors may exist.

Excessive Heat and Cold

WARNING:
Do not expose the instrument to intense sunlight for prolonged periods.
Exposure to excessive heat or cold may result in erroneous readings.

Intended Use

The Multi-PID 2 measures the concentration of airborne gases and vapors that can be ionized by a photoionization detector.
The Multi-PID 2 automatically displays and can record these concentrations.

In the TVOC mode the Multi-PID 2 does not distinguish between individual compounds.
The reading displayed represents the total concentration of all photoionizable chemicals present in the sample. The Multi-PID 2 is factory-set to display concentration in units of ppm.

Benzene is selectively measured in GAS mode.
This measurement requires the use of the PID pre-filter tube benzene. The pre-filter tube adsorbs all substances with the exception of benzene. Only benzene passes into the detector.

Multi-PID 2 Overview

Figure 1 – Multi-PID 2

The Multi-PID 2 operates automatically. The Multi-PID 2 display updates itself once per second. You can read concentrations directly from the display.
The Multi-PID 2 will perform short-term exposure limit (STEL), time-weighted average (TWA) and PEAK calculations when it is in INTERVAL mode. You can view any of these results in INTERVAL mode.

The Multi-PID 2 has two datalogging options, TAG and INTERVAL mode. TAG mode allows the user to manually tag and store readings during a walkthrough. Interval mode allows the user to datalog at selectable intervals of 1 second to 999 seconds.
In INTERVAL mode, the STEL, PEAK and TWA are calculated. If you select INTERVAL mode, these values are automatically recorded in the Multi-PID 2's memory. The Multi-PID 2 can log up to 12,000 entries.

In TAG mode operation, the Multi-PID 2 prompts you to locate a site and then to record a background and sample readings for the site. You can record up to 12,000 manual entries. There is no averaging of data in TAG mode. Tags are set via the PC using the Dräger GasVision software.

Recorded data can be reviewed on the display or downloaded to a computer. Data are recorded by date and time.

The Multi-PID 2 has 5 keys for instrument operation. The keys are used to set up and calibrate the Multi-PID 2. All information entered with the keys and stored in the Multi-PID 2's memory is retained when the instrument is switched off. The clock and calendar continue to operate and do not need to be reset when the Multi-PID 2 is turned on.

General Operation

The Multi-PID 2 is a microprocessor-controlled air monitor for measuring the presence of photoionizable compounds in air at parts-per-million levels. The block diagram in Figure 2 shows the main components of the Multi-PID 2.

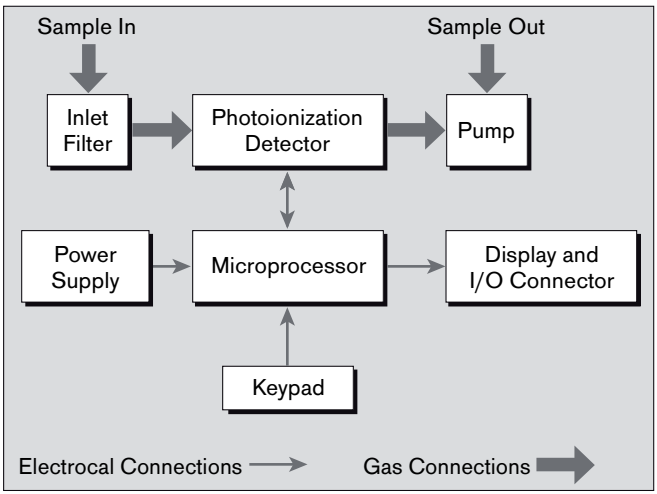

Figure 2 – Multi-PID 2 Block Diagram

The microprocessor controls the components of the instrument and interprets and records the signal generated by the photoionization detector (PID). Recorded data and setup information entered into the microprocessor's memory are retained when the Multi-PID 2 is turned off.

A pump continuously pulls the air under test through the Multi-PID 2's PID. The Multi-PID 2 converts the concentration of photoionizable compounds in the sample into an electrical signal. The microprocessor subtracts any background from the signal and divides this signal by a sensitivity obtained by calibrating with a standard gas of known concentration. This concentration appears on the Multi-PID 2's display and, depending on the values entered through the Multi-PID 2's keypad, an alarm status may be displayed and an audio signal may be heard.

The Multi-PID 2 can detect thousands of different types of airborne gases and vapors and its response depends on the characteristics as well as the concentration of each compound.

The Multi-PID 2 does not distinguish one type of compound from another, but displays a number indicating the total concentration of all photoionizable compounds in the sample.

A standard of isobutylene at a known concentration may be used for setting the sensitivity. If the Multi-PID 2 is calibrated with isobutylene, it displays concentrations in units equivalent to ppm of isobutylene. If isobutylene were the only photoionizable chemical in the sample, then the Multi-PID 2 would display its concentration directly.

The Multi-PID 2 responds more or less readily to other chemicals than it does to isobutylene. Because it has a medium sensitivity to isobutylene, this gas has been chosen as a reliable means of reporting an average concentration of total ionizable compounds present.

Gases other than isobutylene can be used to calibrate the Multi-PID 2. However, all response factors are based on an isobutylene calibration.

Photoionization Detector

The photoionization detector (PID) is shown in Figure 3. The PID measures the concentration of photoionizable chemicals in the gas stream from the sample inlet and produces an electrical signal for the microprocessor.

A UV lamp generates photons which ionize specific molecules in the gas stream. The permanent air gases (argon, carbon dioxide, nitrogen, oxygen, water vapor, etc.) require a relatively high energy for ionization, and are not ionized by the UV photons. Many of the compounds considered pollutants, including most hydrocarbons, are ionized.

The gas stream is directed into the PID through a small port at the center of the UV lamp window and through a series of larger ports around the perimeter of the lamp window. This arrangement permits a high sample flow rate and short response time.

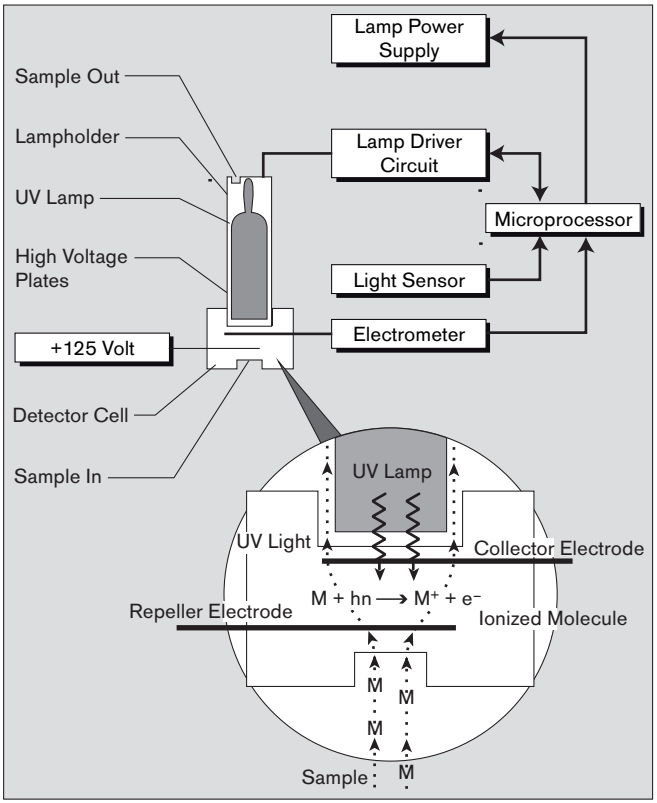

Figure 3 – Photoionization Detector

The ionized molecules in the detector cell are subjected to a continuous electric field between the repeller electrode and the collector electrode. The ions move in the electric field, generating a current which is proportional to the concentration of the ionized molecules in the detector cell. An electrometer circuit converts the current to a voltage which is then fed to the microprocessor.

The UV lamp is operated by a high voltage lamp driver circuit which delivers high voltage energy to the lamp through plates in the lamp holder. The lamp driver power supply is controlled by the microprocessor based on a feedback signal from a light sensor on the driver circuit board.

Unpacking Instrument

Remove the Multi-PID 2 from its shipping box. The following accessories are included with the Multi-PID 2:

1. Sample Probe
2. Instrument Manual
3. Multi-Tool
4. AC Adapter or AC Adapter with AC Line Cord
5. Wrist Strap
6. Replacement Sample Inlet Filters (25 pieces)
7. Reference Card

Ensure that all of these accessories have been included with the instrument. If any items are missing or damaged, contact Dräger Safety immediately.

Support Equipment and Consumables

Calibration

For normal operation these items are required:

1. Calibration Gas Regulator (Part No. 68 10 688).
2. Calibration gas containing 100 ppm isobutylene (Part No. 68 10 687). Other concentrations of the calibration gas may be required. This will depend on your application.
3. Zero air (clean dry air without any organic impurities)

   There are several alternatives for clean or zero air calibration: you can use a bottle of clean air (certified as having not more than 0.1 ppm total hydrocarbons) connected directly to the instrument; the clean air can be transferred to a Tedlar bag which can then be connected to the instrument; clean, ambient air without detectable contamination; or, ambient air run through the charcoal filter (Part No. CH 24 101).
4. If compound threshold limit values (TLVs) are exceeded, you should use a gas bag for sampling and calibration.

   To determine the TLV of the compounds contained in the calibration gas, refer to the Material Safety Data Sheet (MSDS) supplied with your calibration gas cylinder.

Field Operation

For field operation, the Multi-PID 2 Field Kit (Part No. 83 17 663) is available.
The field kit includes a cable kit, a carrying case and a calibration regulator, and a spare battery pack.

Refer to the check list in on page 41 to ensure you have all the necessary accessories and equipment before beginning field operation.

Computer

The Multi-PID 2 may also be connected to a computer. The computer must be a Windows™-based PC.
Use the cable kit (Part No. 83 17 667) to connect the Multi-PID 2 to the computer.
Stored datas are evaluated using the Dräger GasVision software (Part No. 83 14 034).

WARNING:
The Multi-PID 2 is not classified for use in hazardous locations when connected to a computer, danger of an explosion!.

Using the Multi-PID 2

Battery Charging

Before beginning operation of the Multi-PID 2, the battery pack must be charged.
You can also remove the battery pack and replace it with a fully charged spare battery pack (Part No. 83 17 670).

NOTE:
You must use the 220 V battery charger (Part No. 83 17 661) in order to comply with the requirements of the applicable Council Directives.

Removing and Replacing the Battery Pack

WARNING:
Do not remove or recharge the battery pack in a hazardous location. danger of an explosion!

To remove the battery pack:

1. If the Multi-PID 2 has been turned on, turn it off by pressing the ON/OFF key for five seconds and then releasing it.

NOTE:
If you do not turn the Multi-PID 2 off before removing the battery pack, you will reset the instrument and you will lose all logged data and setup parameters.

2. Locate the battery hatch on the back of the instrument. See Figure 4.
3. Loosen the two Phillips screws in the top of the battery hatch.
4. The battery hatch can now be removed.
5. Lift the battery pack out of the case and carefully disconnect the battery pack connector from the Multi-PID 2.
6. Attach the connector from the charged battery pack to the Multi-PID 2.

NOTE:
The connector is polarized. It will only fit one way. Do not force the connection.

7. Place the battery pack in the Multi-PID 2 case. Ensure the battery wires are not pinched or strained.
8. Ensure the wrist strap ring is in proper position. This ring holds the wrist strap in place.
9. Replace the battery hatch and then replace the two screws. Do not overtighten the screws as you will damage the case.

Charging the Battery Pack

NOTE:
Only use the AC adapter specified for use with the Multi-PID 2. Using another AC adapter will result in damage to the battery pack, the Multi-PID 2 or the adapter itself.

To charge the battery pack:

1. Plug the AC adapter into the jack located on the bottom of the Multi-PID 2.
2. Plug the AC adapter into an AC outlet. If you are using the European AC adapter, ensure the correct plug is installed on the line cord. If it is not correct for the wall outlet in your area, then it must be replaced.
3. The Charge LED on the Multi-PID 2 indicates the charge state. Red indicates the battery is being charged. Green indicates the battery is fully charged and ready for use.
   It is normal for a fully charged battery to indicate it is charging (red light) when first plugged in. The Charge LED will turn green within a few minutes to indicate the battery is fully charged.
4. When the battery pack is fully charged, remove the AC adapter first from the wall outlet and then from the Multi-PID 2.

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Figure 4 – Battery Pack Removal and Replacement

Charging a fully discharged battery pack will take approximately 4 hours.

Optionally you can use the off line charger (Part No. 64 05 404) to charge the battery pack when not installed in the Multi-PID 2.

If you are charging the battery pack in the instrument you can use all the features of the Multi-PID 2 while the battery pack is being charged.

Leaving the AC adapter connected to the Multi-PID 2 will not harm the battery or the AC adapter in any way. If the Multi-PID 2 is to be left unused for an extended period of time, leave it connected to the AC adapter so that the battery will be fully charged and ready for operation.

On average a fully charged battery pack will provide 8 hours of continuous operation. Battery life is shorter if the instrument is turned off and then on again repeatedly, or if the backlighting is turned on.

Display

The Multi-PID 2 has a graphic display for reporting detected concentration and to guide you through configuration options. All functions of the Multi-PID 2 will be reported on the display.

Graphic Display

The Multi-PID 2 uses an 8 line graphic display. The display will always be used for reporting detected concentration. In order to accommodate the range of concentrations the Multi-PID 2 can detect, the meter reading will be reported using one of two resolutions. A resolution of 0.1 ppm will be used for concentrations below 100 ppm, and a resolution of 1 ppm will be used for concentrations above 100 ppm .

Figure 5 – Multi-PID 2 Display

The display reports instantaneous concentration at all times when the pump is on. In Interval mode, the display will report instantaneous concentrations as well as PEAK, STEL or TWA.

The Multi-PID 2 is designed for ease of use with a logically organized internal menu structure/user interface.

The Multi-PID 2 User Menu is shown in Figures 6 and 7.

The Multi-PID 2 has three soft keys under the graphic LCD display, which always show the available functions of the soft keys in any screen.

Multi-PID 2 User Menu

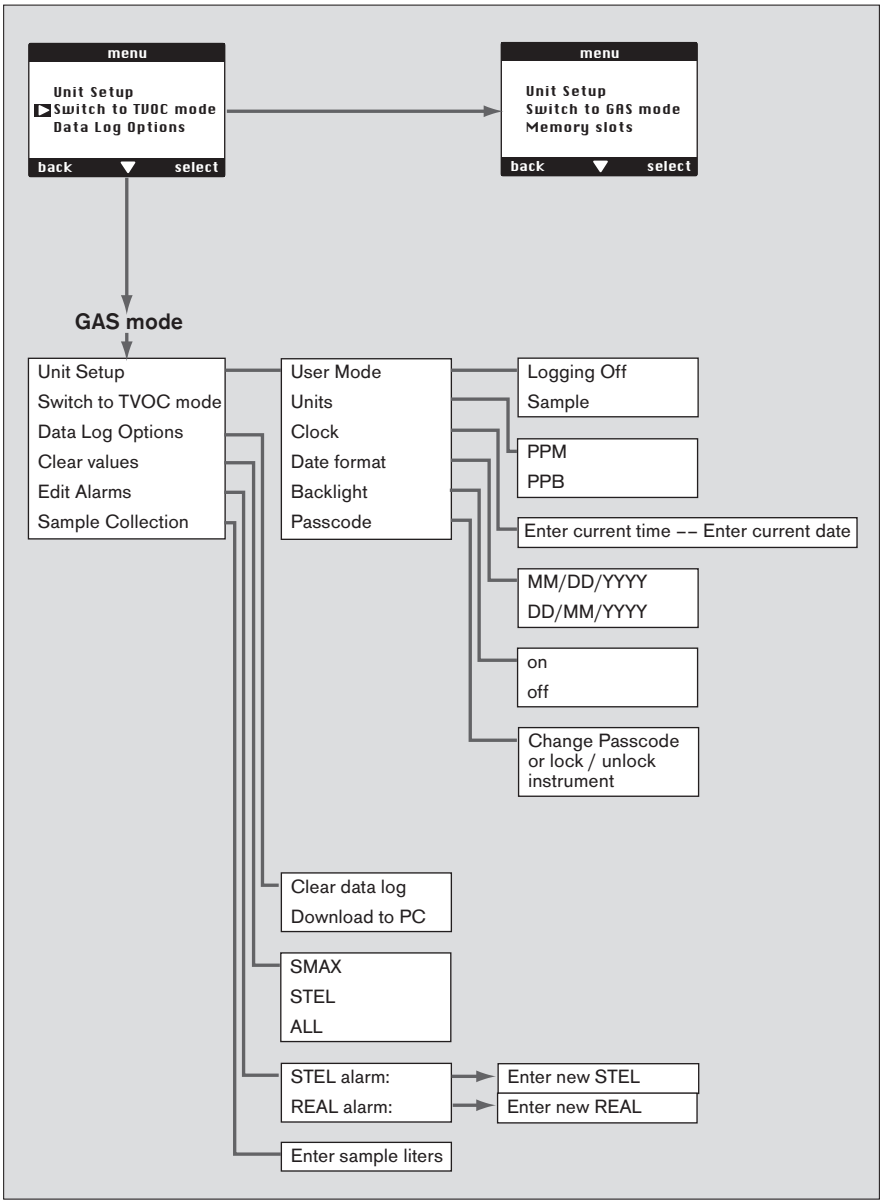


Figure 6 – User Menu, GAS mode

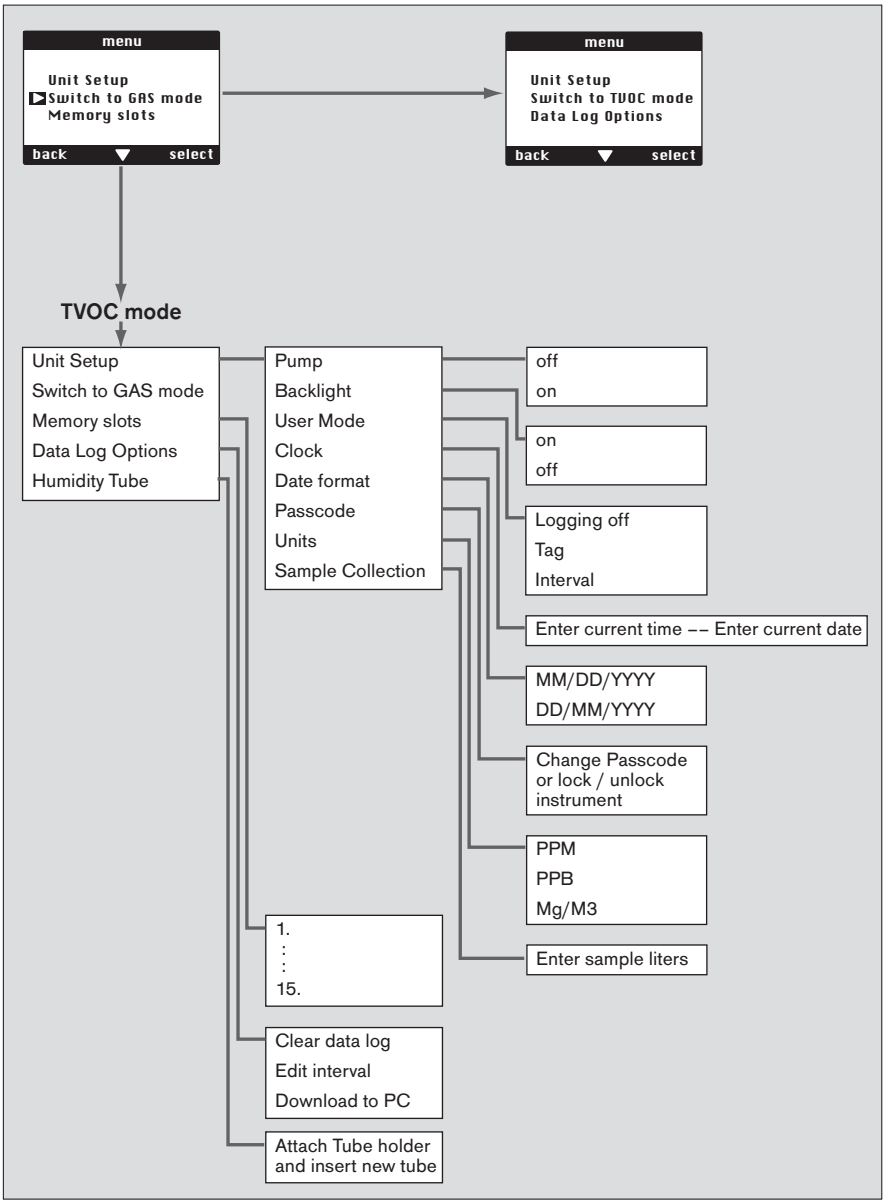


Figure 7 – User Menu, TVOC mode

Keys

Fixed Keys

The Multi-PID 2 has two fixed keys. The first fixed key is the ⏻-key (on/off). The second fixed key is the dedicated CAL-key (calibration key). Pressing the CAL-key will start calibration in almost any mode.

The ⏻-key is used to both turn power on to the Multi-PID 2 as well as the turn the power off. To turn on the Multi-PID 2, press the ⏻-key. To turn the power off, press the ⏻-key and hold it down for 5 seconds, and then release it. This is done to prevent accidental power off.

Soft Keys

The three soft keys on the Multi-PID 2 are located directly below the display. Each key has varying functions for configuring the Multi-PID 2, editing the data, and controlling the display. Since only three soft keys are available, each function is broken down into a path.

Beginning Operation

Turning the Multi-PID 2 On

1. Turn the Multi-PID 2 on by pressing the ⏻-key.
2. The Multi-PID 2 will display the instrument's software version number. Next the Multi-PID 2 will proceed to the mode display.
3. The Multi-PID 2 has an instant-on lamp. For maximum accuracy and stability, allow the Multi-PID 2 to warm-up for 10 minutes prior to calibration.

Default Display

The display shows the last mode the Multi-PID 2 used. The resolution of the display changes with the magnitude of the reading. A reading of 0 to 99.9 will be displayed with a resolution of 0.1 ppm. A reading greater than 99.9 will be shown with a resolution of 1 ppm. The meter will display concentrations up to 10,000 ppm.

GAS mode:
In GAS mode, the PID pre-filter tube benzene (Order No. 81 03 511) can be used to measure benzene, or a sample collection tube (Order No. 67 33 011) can be filled with a defined amount of a sample.
The GAS mode is a filter tube mode. This means that all measurements require the installation of the pre-filter tube holder (83 10 093) and of the pre-filter tubes. The PID pre-filter tube benzene which is mounted at the head end of the tube holder and adsorbs all substances with the exception of benzene is used to selectively measure benzene. The entire process is menu-driven. The selective benzene measurement value is displayed after 90 seconds.
Activating the GAS mode opens a dialog which queries a device calibration. The benzene measurement screen is displayed after installation of the PID pre-filter tube benzene.:

Figure 8 – GAS mode Display

The following values are displayed: benzene concentration in ppm, STEL value, the highest benzene measurement value recorded so far (SMAX), the amount of measurements already carried out (SAMP) – corresponds with the amount of PID pre-filter tube benzene already used, and the sampling interval period of 90 seconds (SECS).
Pressing the " **view** " key shows the Datalogger measurement values.
Pressing the " **menu** " key takes you back to the selection menu.
Pressing the " **sample** " key starts the measurement: the pump is activated and the measured air is drawn through the PID pre-filter tube benzene for 90 seconds. The measurement status is indicated by the flashing concentration value and by the flashing word " **sampling** ". The number 90 displayed under SECS counts down to 0. So the displayed number shows the remaining measuring time. " **SAMPLE DONE** " signalled in the display indicates that the measurement is finished.
The PID pre-filter tube benzene is a one-shot-device and cannot be used for a second measurement. Repeatedly pressing the " **sample** " key will call up the information that the PID pre-filter tube benzene in use is no good and that a new PID pre-filter tube benzene must be put into the pre-filter tube holder. Only after inserting a new tube will pressing the " **sample** " key start a new measurement.

TVOC mode:
The Multi-PID 2 can power up in Logging Off, Tag, or Interval mode depending on the mode that was set by the previous user. The current mode is shown in the upper right-hand corner of the display.

Figure 9 – Logging Off Mode Display

Figure 10 – TAG Mode Display

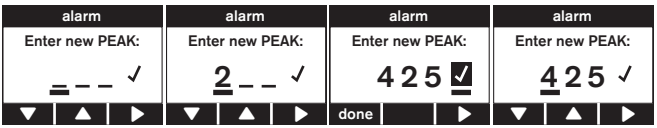
Figure 11 – Interval Mode Display

Numeric Value, Duration, Time and Date Entry

In cases where the system requires the user to enter a number, duration, time, or date, the following mechanism is used. The number of digits to be entered depends on the type of value being entered. Upon entering a value entry screen, a bar icon below the left most digit highlights it as the active digit. The arrows " ▲ " (middle soft button) and " ▼ " (left soft button) are used to increase/ decrease the digit. The bar icon is moved to the next digit to the right using the " ▶ " soft button. Once the user has finished entering the value they use the right soft button to move the bar icon to the far right to highlight the OK check mark " ✓ ". When the bar is under the OK check mark " ✓ ", the left soft button changes to **» done «**. The user is then able to input the value. Pressing the right soft button while the OK check mark " ✓ " is highlighted will return the bar icon to the left most digit.

In some cases, units may be specified (e.g., ppm or hh:mm); in others there may be no units.

No cancel option is available to the user. They must input a value.



Instrument Status

The instrument status is shown on the left of the first line of the status display. Each status has a priority assigned to it. If more than one status is in effect, then the status with the highest priority is displayed until the condition is corrected or until the option is turned off. Table 1 is a list of the possible system alerts.

Table 1 – System Alerts

Multi-PID 2 Display	Description
» Zero Air Error «	Zero gas too high
» Span Gas Error «	Span gas too low
» Pump Error «	Pump fault
» UV Lamp Error «	UV lamp fault
» Blocked Filter «	Blocked sample inlet filter
» Low Battery Icon «	Low battery
» Data Log Full «	Data memory full
» » Unit Locked «	Unit locked by passcode
» Unit Communicating with PC «	Instrument communicating with PC
» Instrument Over Range «	Sample concentration over instrument operating range
» Alarm « + R Icon	Real time concentration alarm
» Alarm « + T Icon	TWA concentration alarm
» Alarm « + S Icon	STEL concentration alarm

System Alerts and Alarms

While operating the instrument, system alerts can occur. To accurately identify the source of the alarm, each type of alarm has been given a unique status.

In addition to the status, the Multi-PID 2 also has an audio alarm and an alarm LED. To conserve power, the Multi-PID 2 alternates between the LED and audio. Different alarms are identified by the frequency at which the Multi-PID 2 alternates between the audio and LED; Peak alarm is 5 times per second, STEL alarm is 2.5 times per second, and TWA alarm is 1.25 times per second.

A soft key is used for acknowledging alarms and is named **“ accept ”**. If no alarm exists, then the **“ accept ”** key is not shown. To clear the alarm, press the **“ accept ”** key. Once acknowledged, the alarm indicators are cleared. The alarm status will remain until the alarm condition clears.

The Multi-PID 2 updates the instantaneous concentration once every second.
Following every update, the instantaneous concentration is compared to the peak alarm level, and if exceeded, an alarm is triggered.

In Interval mode, if a 15-minute average exceeds the STEL, a STEL alarm is generated. The TWA alarm is generated when the current average of concentration, since the TWA was last cleared, has exceeded the TWA exposure limit.

During calibration, all alarms are disabled. Once the calibration is complete, the alarms are re-enabled.

Short-Term Exposure Limit (STEL) Mode

The Short-Term Exposure Limit (STEL) mode displays the concentration as a 15-minute moving average. The Multi-PID 2 maintains 15 samples, each representing a one-minute averaging interval.

Once every minute, the oldest of the 15 samples is replaced with a new one-minute average. This moving average provides a 15-minute average of the last 15 minutes with a one-minute update rate. Since the average is calculated using 15 one-minute averages, the meter display will only update once every minute.
STEL is set to zero each time the instrument is turned on. Since STEL is a 15-minute moving average, there is no need to clear or reset the STEL.
STEL calculations are always being performed by the Multi-PID 2. You can display the results of the calculations by selecting Interval Mode.

Time-Weighted Average (TWA) Mode

The TWA accumulator sums concentrations every second until 8 hours of data have been combined. If this value exceeds the TWA alarm setting, a TWA alarm is generated. The TWA is not calculated using a moving average. Once 8 hours of data have been summed, the accumulation stops. In order to reset the TWA accumulator, press the " **clear** " key, then select **» TWA «** using the " ▼ " key, then press " **clear** ".

This sum will only be complete after 8 hours, so the meter displays the current sum divided by 8 hours.

TWA calculations are always being performed by the Multi-PID 2. You can display the results of the calculations by selecting Interval mode.

PEAK Mode

The PEAK mode displays the current detected concentration. The reading is updated once a second. In the background, the Multi-PID 2 datalogger is sampling the concentration and measuring minimum, maximum, and average concentrations for the selected averaging interval. At the end of every interval, one entry is placed in the datalogger until the datalogger is full.

In order to reset the PEAK reading, press the " **clear** " key then select **» PEAK «** using the " ▼ " key then press " **clear** ".

Preparing for Field Operation

Field Check List

When using the Multi-PID 2 for field operation, the following items should be carried into the field to reduce or eliminate down time of the instrument.

If you are going to be in the field for a single 8-10 hour day, then you should include the following accessories:

Table 2 – Check List for Field Items

✓	Spare battery pack	Part No. 83 17 670
✓	Spare 10.6eV lamp	Part No. 83 18 307
✓	Multi-PID 2 multi-tool	Part No. 64 05 415
✓	Short sample probe	Part No. 64 05 412
✓	Calibration regulator	Part No. 68 10 688
✓	Tank(s) of calibration gas	Part No. 68 10 687
✓	Spare inlet filters	Part No. 83 17 681
✓	Carrying case	Part No. 83 17 664
✓	DC power cord	Part No. 64 05 421
✓	Tube Holder	Part No. 83 19 093
✓	Dräger Charcoal Tube, Carbon filter (for zero point calibration)	Part No. CH 24 101
✓	Dräger Tube, PID Humidity Filter	Part No. 81 03 531
	Sampling Tube (Activated Charcoal, Type BIA)	Part No. 67 33 011
	PID Pre-Filter Tube Benzene	Part No. 81 03 511
✓	Instrument manual	Part No. 90 23 767

If you will be in the field for more than one day, you should include the following additional items:

Table 3 – Additional Field Items

✓	AC adapter	Part No. 83 17 661
✓	Cable kit	Part No. 83 17 667
✓	Computer and associated cables	

Operational Check List

Before beginning field work, set up and calibrate the Multi-PID 2 for your particular application.

To ensure the instrument is in working order before heading into the field:

1. Ensure the battery pack is fully charged. If you are unsure about the status of the battery, replace the battery pack with one that is fully charged. See battery charging on page 26.
2. After calibration is complete, sample the calibration gas and the bag of zero air to ensure the Multi-PID 2 has been calibrated correctly.
3. Select the correct operating mode. See Section regarding Operation Modes page 54.

Connecting Accessories

Computer

The Multi-PID 2 will download information stored in its datalogger to a Windows® based computer. This option may be used if you need to prepare reports based on the Multi-PID 2's recorded data. This feature may also be used if you need the recorded data in a format that can be imported into a spreadsheet or database for further calculations.

NOTE:
The Multi-PID 2 is not classified for use in hazardous locations when connected to any computer.

The instructions below will provide you with the basic information for using the Multi-PID 2 with the Multi-PID 2 communications software, the Multi-PID 2 Comm. In order to use these instructions, you must be familiar with Microsoft Windows and it must be installed and running on your computer.

To initiate communications between the Multi-PID 2 and a PC:

1. Turn the Multi-PID 2 off.

NOTE:
You must turn the instrument off before connecting or disconnecting the computer cable.

2. The Multi-PID 2 must be connected to a serial port. Use the computer cable (Part No. 83 17 667) to connect the Multi-PID 2 to one of the computer's serial ports. Remember which serial port you are using as you will need this information when you set up the Dräger GasVision software. Normally you will use Com1 or Com2.
3. If the Multi-PID 2 printer cable plugs directly into the port on the computer without the gender changer or the 9 to 25-pin adapter, you are most probably connected to a parallel port. You will need at least one of the adapter cables to connect the Multi-PID 2 to a serial port. Once all connections have been made, turn on the Multi-PID 2 instrument.
4. Start the Dräger GasVision software as you would any Windows® program. The Dräger GasVision splash screen will appear on the PC. Once the Dräger GasVision software is running, the PC is ready to receive data from the Multi-PID 2.
5. On the Multi-PID 2, the number of data bits has been fixed at 8, stop bits has been fixed at 1. Parity has been set at None and the Flow control is Xon/Xoff. These values are set automatically by the Dräger GasVision software.

6. On the Multi-PID 2, press the " **menu** " key, choose **» Data Log Options «**, then press the " **select** " key.
7. Choose the **» Download to PC «** option using the " ▼ " key and press the " **select** " key.
8. Follow the Multi-PID 2 prompts to start the data download.

NOTE:
A DB-25, female connector is sometimes a parallel port. Do not connect the serial port of the converter to a parallel port.

Pre-filter Tube Holder

The optional pre-filter tube holder (Order No. 83 19 093) is shown in figure 12. The pre-filter tube holder is designed to hold the optional charcoal pre-filter tube (Order No. CH 24 101) for calibration in clean air, the optional PID pre-filter tube humidity (Order No. 81 03 531) to enhance the measuring performance in TVOC mode by reducing the humidity, the optional sampling tube with activated carbon (Order No. 67 33 011) and the PID pre-filter tube benzene (Order No. 81 03 511) for selective benzene measurement in GAS mode.

The tube holder attaches to the Multi-PID 2 on the inlet nozzle replacing the standard inlet nozzle cap. It is a simple twist lock application.

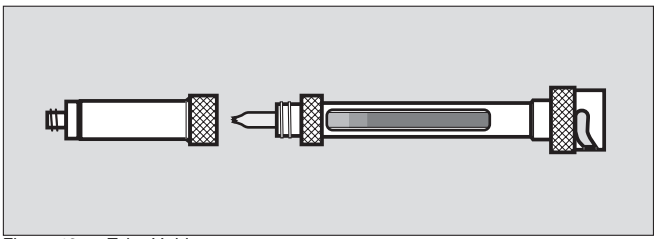


Figure 12 – Tube Holder

To insert a pre-filter tube into the tube holder:

1. Unscrew the top part of the tube holder immediately above the tube window.
2. Break off each end of the glass tube by inserting the end into the opening as shown.
3. Insert tube into holder.
4. Re-screw on the top part of the tube holder (note: the tube holder is designed to compensate for any minor irregularities in the tube that result from the breaking off of each end).

To remove a pre-filter tube from the tube holder:

1. Unscrew the top part of the tube holder immediately above the tube window.
2. Lift the pre-filter tube from the tube holder.
3. Either insert another tube or re-attach the top part of the tube holder.

Pre-filters and Sample Collection Tubes

Dräger Safety provides a variety of pre-filter tubes for the Multi-PID 2. The tubes are custom developed for Dräger Safety AG & Co., and address clean air calibration and humidity reduction to facilitate more accurate sampling.
The optional sample collection tubes are standard Dräger tubes used for collecting VOC samples for analysis later in a lab or other analytic facility.

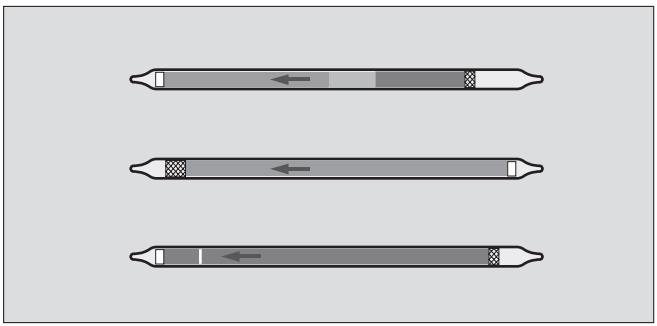


Figure 13 – Dräger Pre-filter Tubes

Sample Line

A 3-meter (9') sample line (Part No. 64 05 411) may be connected to the Multi-PID 2 for remote sampling. Connect the sample line to the Multi-PID 2 inlet using the fittings supplied with the sample line.

NOTE:
When using the sample line, be especially careful not to aspirate liquids or solids as they will damage the Multi-PID 2.

Wrist Strap

To use the wrist strap:

- Turn off the Multi-PID 2 and then remove the battery cover. See Removing and Replacing the Battery Pack on page 26.
- Place the metal ring of the wrist strap in the circular notch located on the battery door.
- Replace the battery cover.
- Adjust the strap length as necessary.

DC Power Cord

The Multi-PID 2 can be connected to a car battery through the cigarette lighter with the DC power cord. While the Multi-PID 2 is connected to the car battery, the Multi-PID 2 battery is being charged.

NOTE:
The 2Multi-PID 2 is not classified for use in hazardous locations with a DC power cord.

To connect the Multi-PID 2 to a DC power supply:

1. Turn the instrument off by pressing the ON/OFF key for five seconds.
2. Connect the DC power cord (Part No. 64 05 421) to the Multi-PID 2 AC adapter jack on the rear of the instrument.
3. Connect the other end of the DC power cord to the cigarette lighter in the car.
4. Turn the instrument on again by pressing the ON/OFF key.

If the vehicle is running, ensure the engine exhaust does not contaminate your samples.

Belt Clip Holster

Use the belt clip holster (Part No. 83 17 677) to protect the instrument and to mount the instrument to a belt.

11.7 eV UV Lamp

General Information

The Multi-PID 2 is equipped with a standard 10.6 eV UV lamp. An 11.7 eV UV lamp (Part No. 83 18 317) is available for special applications.
Install this lamp as outlined in Removing and Replacing the UV Lamp on page 80. When you install a UV lamp other than the standard 10.6 eV lamp, all the response factors become invalid. You must set the response factor for the current cal memory to 1. Contact Dräger Safety's Applications Department for further information.

NOTE:
Do not use the 11.7 eV lamp in conjunction with the dilution probe.

Limitations of Lithium Fluoride Lamp Window

This lamp is intended for special applications only. It is not suitable for normal operation, due to limitations of the lamp window material.

The 11.7 eV lamp window material is lithium fluoride (LiF). LiF is composed of two light elements which are easily disrupted within the crystal lattice by the UV light generated by the lamp. Disruption of the lattice causes the crystal to turn a yellowish color, and again performance declines.

Unlike other lamp windows, LiF readily absorbs water from atmospheric humidity. When contaminated by moisture, the window loses its ability to transmit UV light.

NOTE:
Do not touch the lamp window or handle it near water.

Using the 11.7 eV UV Lamp

With an 11.7 eV lamp installed, your instrument functions as a detector responding to compounds which ionize at 11.7 eV or less. The 11.7 eV lamp may be useful for detecting compounds not ionized by the standard 10.6 eV lamp.

Due to the lamp window limitations, the lifetime of the 11.7 eV lamp is restricted and it must be used sparingly according to the following instructions.

To use the 11.7 eV lamp in your the Multi-PID 2:

1. Remove the 11.7 eV lamp from the supplied desiccant bottle and install the lamp as outlined in Removing and Replacing the UV Lamp on page 80.

NOTE:
Do not remove or replace any detector lamp in a hazardous location

2. Turn the instrument on and wait for the ready status. If the lamp cannot be started, contact Dräger Safety's Technical Support Department.
3. Calibrate the Multi-PID 2. See Calibration Using the Flow-Match Regulator on page 76.
4. All response factors are invalid when an 11.7 eV lamp is installed. The response factor must be set to 1.
5. Recalibrate the instrument every 15 minutes of operation.
6. Every hour of operation, switch off the instrument, remove the lamp and examine the window for yellowing. If the window is yellow, then regenerate the window according to the procedure in Cleaning the Lithium Fluoride Window on page 83.
7. After use, remove the lamp and store it in the supplied desiccant bottle.

Do not leave the 11.7 eV lamp in the instrument when you turn it off. Always remove the 11.7 eV lamp and store it in the supplied desiccant bottle

Off-Line Charger

General Information

The off-line charger (Part No. 64 05 404) allows you to charge a battery pack independently of the Multi-PID 2. To charge a battery pack without removing it from the Multi-PID 2, see Battery Charging on page 26.
The off-line charger requires one of the following the Multi-PID 2 accessories for operation:

AC Adapter	Part No. 64 05 428 (North America)
AC Adapter	Part No. 83 17 661 (Europe)
DC Power Cord	Part No. 64 05 421

Use only the AC adapter specified for use with the Multi-PID 2. Using another AC adapter will result in damage to the battery pack, the off-line charger, or the adapter.

Charging from an AC Source

NOTE:
Do not charge the battery pack in a hazardous location.

To re-charge your battery pack:
1. Remove the battery pack as outlined in Battery Charging on page 26.
2. Attach the connector from the battery pack to the socket on the off line charger.

NOTE:
The connector is polarized. It will only fit one way. Do not force the connection.

3. Plug the AC adapter into the jack on the opposite face of the off-line charger.
4. Plug the AC adapter into an AC outlet. If you are using the European AC adapter, ensure the correct plug is installed on the line cord. If it is not correct for the wall outlet in your area, then it must be replaced.
5. The LED on the upper face of the off-line charger indicates the charge state of the battery pack. Red indicates the battery is being charged. Green indicates the battery is fully charged.
6. Charging a fully discharged battery pack will take approximately four hours.

7. It is normal for a fully charged battery pack to indicate it is charging (red light) when first plugged in. The LED will turn green within a few minutes to indicate the battery is fully charged.
8. When the battery pack is fully charged, remove the AC adapter, first from the wall outlet, then from the off line charger.
9. Remove the battery pack connector from the socket on the off-line charger.
10. Replace the battery pack in the Multi-PID 2 as outlined in Removing and Replacing the Battery Pack on page 26.

You can keep the battery pack fully charged indefinitely, without overcharging it, by leaving it connected to the off-line charger while the charger is operating.

Charging from a DC Source

To re-charge your battery pack:

1. Remove the battery pack as outlined in Removing and Replacing the Battery Pack on page 26.
2. Attach the connector from the battery pack to the socket on the off-line charger.

NOTE:
The connector is polarized. It will only fit one way. Do not force the connection.

3. Plug the DC power cord into the jack on the opposite face of the off-line charger.
4. Plug the DC power cord into a vehicle auxiliary 12 VDC or cigarette lighter socket.
5. The LED on the upper face of the off line charger indicates the charge state of the battery pack. Red indicates the battery is being charged. Green indicates the battery is fully charged.
6. Charging a fully discharged battery pack will take approximately 4 hours.
7. It is normal for a fully charged battery pack to indicate it is charging (red light) when first plugged in. The LED will turn green within a few minutes to indicate the battery is fully charged.
8. When the battery pack is fully charged, remove the DC power cord, first from the vehicle auxiliary 12 VDC or cigarette lighter socket, then from the off-line charger.
9. Remove the battery pack connector from the socket on the off-line charger.
10. Replace the battery pack in the Multi-PID 2 as outlined in Battery Charging on page 26.

You can keep the battery pack fully charged indefinitely, without overcharging it, by leaving it connected to the off line charger while the charger is operating.

Menu Functions

User Interface – Basic Menu

The Multi-PID 2 is designed for ease of use with a logically organized internal menu structure/user interface. The Multi-PID 2 User Menu is shown in Figures 6 and 7 on page 30 and page 31.

The Multi-PID 2 has three soft keys under the graphic LCD display which always show the available functions of the soft keys in any screen.

Operation Modes

GAS mode

The GAS mode is a filter tube mode. This means that all measurements require the installation of the pre-filter tube holder and of the pre-filter tubes. In this selective measuring mode, the PID pre-filter tube benzene which is mounted at the head end of the pre-filter tube holder and adsorbs all substances with the exception of benzene is used to selectively measure benzene. The entire process is menu-driven. The selective benzene measurement value is displayed after 90 seconds.

Activating the GAS mode opens a dialog which queries a device calibration. The benzene measurement screen is displayed after installation of the PID pre-filter tube benzene. The following values are displayed: benzene concentration in xx ppm, STEL value, the highest benzene measurement value recorded so far (SMAX), the amount of measurements already carried out (SAMP) – corresponds with the amount of PID pre-filter tube benzene already used, and the sampling interval period of 90 seconds (SECS).
Pressing the " **view** " key shows the Datalogger measurement values.
Pressing the " **menu** " key takes you back to the selection menu.
Pressing the " **sample** " key starts the measurement: the pump is activated and the measured air is drawn through the PID pre-filter tube benzene for 90 seconds. The measurement status is indicated by the flashing concentration value and by the flashing word " **sampling** ". The number 90 displayed under SECS counts down to 0. So the displayed number shows the remaining measuring time. " **SAMPLE DONE** " signalled in the display indicates that the measurement is finished.
The PID pre-filter tube benzene is a one-shot-device and cannot be used for a second measurement. Repeatedly pressing the " **sample** " key will call up the information that the PID pre-filter tube benzene in use is no good and that a new PID pre-filter tube benzene must be put into the pre-filter tube holder. Only after inserting a new tube will pressing the " **sample** " key start a new measurement.

TVOC mode

In TVOC mode, the Total Volatile Organic Compounds are detected.

Changing the Operating Mode

1. Press the " **menu** " key.
2. Use the " ▼ " key to select " **Switch to GAS mode** " resp. " **Switch to TVOC mode** " , then press " **select** ".

Unit Setup Menu

Unit setup functions are used to select the Multi-PID 2 features. There are nine functions which can be set on the Multi-PID 2; » **Pump «,** » **Backlight «,** » **User Mode «,** » **Clock «,** » **Date format «,** » **Passcode «,** » **Units «**, and » **Sample Collection «**.
Figure 14 shows a menu detailing the User Setup functions. Press the " **menu** " key in any operating mode to access **» Unit Setup «**.

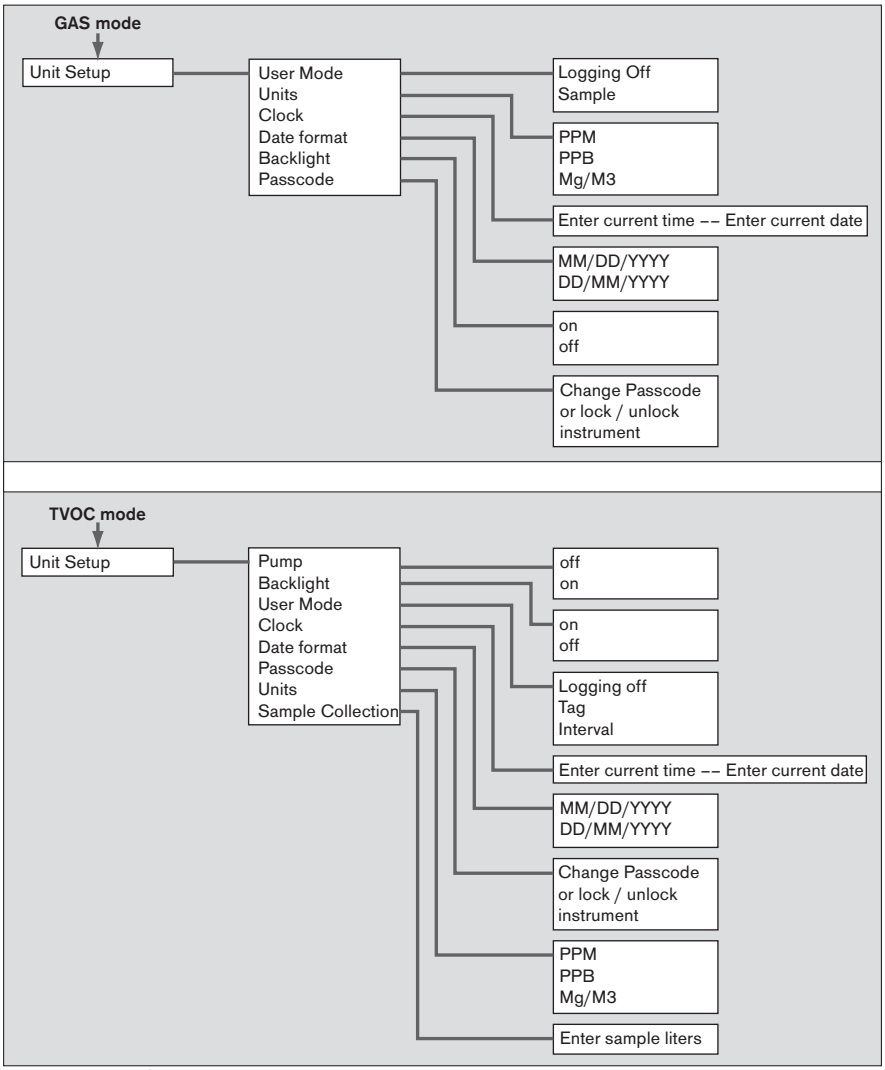


Figure 14 – Unit Setup Map

Pump

Only available in TVOC mode.
The function **» Pump «** turns the pump on and off.

The detector is turned off when you turn the pump off. This prevents the detector from being damaged when there is no sample flowing through the detector.

When the pump and the detector are off, the meter display will continue to read normally but the instantaneous reading is at 0.0. Turn the pump and detector off when concentration measurements are not necessary, and the Multi-PID 2 will only be used for setup or reviewing data. By operating the instrument with the pump and detector off when you do not need them, you will conserve the battery and ultraviolet (UV) lamp.

To turn the pump on:
1. Press the " **menu** " soft key, **» Unit Setup «**, press " **select** ", **» Pump «**, press " **select** ", " **on** ", then press " **select** ".

To turn the pump off:
2. Press the " **menu** " soft key, **» Unit Setup «**, press " **select** ", **» Pump «**, press " **select** ", " **off** ", then press " **select** ".

Backlight

The function **»Backlight «** is used to switch the backlighting on and off when there is insufficient light to read the display.

Switching on the backlight:
1. Press the " **menu** " key. Select " **Unit Setup** ", then press " **select** ". Select " **Backlight** ", then press " **select** ". Select " **on** ", then press " **select** ".

Switching off the backlight:
2. Press the " **menu** " key. Select " **Unit Setup** ", then press " **select** ". Select " **Backlight** ", then press " **select** ", select " **off** ", then press " **select** ".

To extend the operating life of the battery pack, turn the backlighting off when it is not required.

User Mode

The " **User Mode** " function selects one of the offered logging modes. The logging modes are:
In GAS mode – " **Logging off** " and " **sample** ".
In TVOC mode – " **Logging off** ", " **Tag** " and " **Interval** ".

» Logging off «

Logging Off mode is identified by the word **» LOG «** with a diagonal line through the word **» LOG «** in the upper right corner of the Multi-PID 2 display. Logging Off will continuously display the concentration of total volatile compounds present that the Multi-PID 2 can ionize. The reading is updated approximately once per second. In Logging Off mode, the only soft key displayed is " **menu** ".
" **menu** " selects the Multi-PID 2's internal menu for the instrument setup by the user.

Activating " Logging off ":

1. Press the " **menu** " key and select " **Unit Setup** ", then press " **select** ". Select " **User Mode** ", then press " **select** ".
2. Select " **Logging Off** ", then press " **select** "

In this mode, the only soft key displayed is the " **menu** " key.
" **menu** " selects the Multi-PID 2's internal menu for the Multi-PID 2 setup by the user.

» Sample «

Only available in GAS mode.
This function starts the measurement with the PID pre-filter tube benzene = benzene measurement. See also page 33 and page 54.

Activating " sample " mode:

1. Press the " **menu** " key and select " **Unit Setup** ", then press " **select** ". Select " **User Mode** ", then press " **select** ".
2. Select " **sample** ", then press " **select** "

In this mode, the soft keys " **view** ", " **sample** " and " **menu** " are active.

Pressing the " **view** " key shows the latest measured values stored in the Datalogger.

Pressing the " **sample** " key starts a new benzene measurement.

" **menu** " selects the Multi-PID 2's internal menu for the Multi-PID 2 setup by the user.

» TAG «
Tag mode is identified by the word **» TAG «** in the upper right-hand corner of the Multi-PID 2 display. Tag mode will continuously display the instantaneous concentration of total volatile compounds. Tag mode also allows the user to manually tag and datalog readings. Tag mode allows the user to datalog a background reading, a sample reading and assign Site Codes to readings. Site Codes are set using the Dräger GasVision software. See “Connecting Accessories” on page 43, for more information on how to use the Dräger GasVision software. In Tag mode, the soft keys are " **view** ", " **tag** " and " **menu** ".

Activating " tag " mode:
1. Press the " **menu** " key and select " **Unit Setup** ", then press " **select** ". Select " **User Mode** ", then press " **select** ".
2. Select " **tag** ", then press " **select** "

In this mode, the soft keys " **view** ", " **tag** " and " **menu** " are active.

" **view** " selects datalogger review.

" **tag** " selects “No Label”, “Background”, or “Sample”.

" **menu** " selects the Multi-PID 2’s internal menu for the Multi-PID 2 setup by the user.

» Interval «
Interval displays the instantaneous readings as well as STEL, TWA, and PEAK readings. Interval mode is identified by the letters **» INT «** in the upper right-hand corner of the Multi-PID 2 display. Interval automatically calculates and updates STEL, TWA, and PEAK readings. Interval mode also automatically stores these readings in the Multi-PID 2’s memory at a preset interval selected by the user. In interval mode data is logged at a user selected interval value between 1 second and 999 seconds.
The microprocessor accumulates all readings in an averaging interval that you select, and determines the minimum, average and maximum readings. It stores these numbers along with the highest priority instrument status and the most recent time and date.
These recorded data can now be reviewed and edited. Recorded data can also be printed using the PC. For each averaging interval, the Multi-PID 2 prints the minimum of all the minima, the average of all the readings for the interval and the maximum of all the maxima.

In STEL mode, 15 samples are combined to form a 15-minute average. Once every minute, the oldest of the 15 samples is replaced with a new one-minute average. This moving average provides a 15-minute average with a one-minute update rate so the meter display will only update once every minute. STEL is set to zero each time the instrument is turned on.
STEL calculations are always being performed by the Multi-PID 2. You can display the results of the calculations by selecting STEL as the Display mode.

In PEAK mode, the reading is updated once a second. In the background, the Multi-PID 2 datalogger is sampling the concentration and measuring min, max, and average concentrations for the selected averaging interval. At the end of every interval, one entry is placed in the datalogger until the datalogger is full.

TWA mode sums concentrations every second until 8 hours of data have been accumulated. Once 8 hours of data have been summed, the accumulation stops.
This sum will only be complete after 8 hours, so the meter displays the current sum divided by 8 hours. While you are in TWA mode, the time on the status display will show the number of minutes and hours of data that TWA has accumulated. When this reaches 8 hours, the Multi-PID 2 stops accumulating data and the TWA is complete.
TWA calculations are always being performed by the Multi-PID 2. You can display the results of the calculations by selecting TWA as the Display mode.
Interval mode logs readings at user-selected intervals of 1 second to 999 seconds.

Figure 15 – Intervall time adjustment

Interval simultaneously displays the STEL, TWA, and PEAK reading along with the instantaneous reading. The Multi-PID 2's Datalogger can store up to 15000 entries. The interval you select will determine the period of operation. At the end of the period, the datalogger will be full and you will see the "Data Log Full" status.

Table 4 – Averaging Intervals and Period STEL, TWA, and PEAK Operation

Averaging Interval (example)	Hours of Operation to Fill the Datalogger
15 s	50
1 m	200
2 m	400
5 m	1000
15 m	3000

The Multi-PID 2's display can show four values in Interval mode: STEL, TWA, and PEAK, plus the instantaneous reading.

Activating " Interval " mode:

1. Press the " **menu** " key and select " **Unit Setup** ", then press " **select** ". Select " **User Mode** ", then press " **select** ".
2. Select " **Interval** ", then press " **select** "

In Interval mode, the soft keys are " **view** ", " **clear** " and " **menu** ".

" **view** " selects datalogger review.

" **clear** " shows the selection options " **TWA** " " **PEAK** ", or " **All** ". Use the " ▼ " key to select one of the selection options, then press " **clear** " to delete the stored data of the corresponding option.

" **menu** " selects the Multi-PID 2's internal menu for the Multi-PID 2 setup by the user.

Clock

The function **» Clock «** is used to set both the current date and time.

Entering Numbers with the Soft Keys to Set the Clock

For all information that you must enter, the left, center and right soft keys correspond to the " ▼ ", " ▲ " und " ▶ " arrow, "Figure 16 – Setting the Time" on page 62.
The " ▼ " und " ▲ " keys are used to change the character highlighted by the cursor. The " ▶ " key is used to advance the cursor to the next character on the right. When the cursor is advanced past the right most character or symbol " ✓ ", it wraps around to the first character again. To accept the changes, press the " **done** " soft key when the checkmark is highlighted.

Figure 16 – Setting the Time

To set the time and date:

1. Press the " **menu** " soft key.
2. With **» Unit Setup «** highlighted, press the " **select** " soft key.
3. Using the " ▼ " soft key, highlight **» Clock «**. Press the " **select** " soft key.
   The " ▲ " and " ▼ " soft keys are used to change the character underlined by the cursor. The " ▶ " key is used to advance the cursor to the next character on the "right. When the cursor is advanced past the right most character, it wraps around to the first character again.

   Formatting characters, such as the colon **» : «** in the time, the decimal **» . «** in a concentration, and the slash **» / «** in date are skipped when advancing the cursor.
4. Use the " ▲ " and " ▼ " keys to enter the correct time. The time is formatted as Hour:Minute.
5. Use the " ▶ " soft key until the checkmark " ✓ " on the display is highlighted. Press the " **done** " soft key to confirm the time and move to the date option.
6. When setting the date, the Multi-PID 2 prompts you for the current date formatted as Month/Day/Year. Use the " ▲ " " ▼ " and " ▶ " to enter the correct date.
7. Press the " **done** " soft key to confirm the date and the display will return to the main screen.

Date Format

Use the " **Date format** " function to select the displayed date format " **MM/DD/YYYY** " or " **DD/MM/YYYY** ".

Selecting a format:

1. Press the " **menu** " key and select " **Unit Setup** ", then press " **select** ", **and select** " **Date format** ", then press " **select** " and select date format, then press " **select** ".

Passcode

The " **Passcode** " function can be used to change the passcode as well as to activate or de-activate the menu function block.

The " **lock** " function is used to prevent access to the Multi-PID 2's sensitive options. Sensitive options are those which can affect the Multi-PID 2's readings. If any of these functions is selected when the instrument is locked, the Multi-PID 2 will prompt you to unlock the instrument before you can access the functions.

The " **unlock** " function is used to obtain access to the Multi-PID 2's sensitive options.

The " **change** " function can be used to change the set passcode. The unit always has a passcode in force. When shipped from the factory, the code is 0000.

1. Press the " **menu** " soft key. Highlight **» Unit Setup «** and press the " **select** " soft key. Use the " ▼ " soft key to highlight **» Passcode «**, the press the " **select** " soft key.
2. Choose either " **unlock** ", " **change** " or " **lock** " soft keys. You will be prompted for a passcode. Using the " ▲ " " ▼ " and " ▶ " soft keys, enter the passcode. Press the " ▶ " soft key until the Checkmark " ✓ " is highlighted and select the " **done** " soft key.

NOTE:
If you change the passcode, make sure you record the setting. If you cannot remember your passcode once the instrument is lokked, there is no way to unlock it without losing all your data log contents. Unlocking the instrument without a password is accomplished by doing a reset or "cold start". To do the reset, hold the middle-upper key while turning the instrument on with the on/off key.

Units

The " **Units** " function can be used to select the unit of the displayed measurement value:
" **PPM** " (parts per million), " **PPB** " (parts per billion) and" **Mg/M3** "(milligrams per cubic meter).

1. Press the " **menu** " key. Highlight " **Unit Setup** ", then press " **select** ". Use the " ▼ " key to highlight " **Units** ", then press " **select** ".
2. Select either " **PPM** ", " **PPB** " or " **Mg/M3** ", then press " **select** ".

NOTE:
To utilize the » Mg/M3 « unit of measure, the instrument must be configured and operated with a compound chosen from the Multi-PID 2's Preset RF library because a molecular weight value is needed for the » Mg/M3 « calculation. If you wish to use the » Mg/M3 « unit of measure while doing TVOC work, you should use a memory slot with Isobutylene selected from the Preset RF library. Refer to Section: Response Factors and Memory Slots for further information.

Sample Collection

The " **Sample Collection** " function is used to suck a defined air volume through the device, e.g. to fill a preceding sampling tube (sampling tube with activated carbon 67 33 011) or a gas-sampling tube with a defined air volume. The sampling tube or the air collected using the gas-sampling tube can be later analysed in a lab. This process is menu-driven. The desired air volume in litres can be adjusted using the arrow keys. It takes three minutes to take a sample of one litre. In TVOC mode, the " **Sample Collection** " function is in the " **Unit Setup** " menu. In Gas mode, this function is in the main menu.

1. Press the " **menu** " key. Highlight " **Unit Setup** ", then press " **select** ". Use the " ▼ " key to highlight " **Sample Collection** ", then press " **select** ".
2. Use the arrow keys " ▲ " and " ▼ " to set the value.
3. Press " **done** " to accept the set value.

Memory slots Menu

Only available in TVOC mode.

General Information

The response of a PID to a compound is dependent on its ionization potential. In certain situations when the user is confident that only a single specific compound exists, they can set up the Multi-PID 2 using an isobutylene calibration to mimic the Multi-PID 2 response as if the Multi-PID 2 was calibrated using that specific single compound. In situations where only a single pure compound is present in air, the Multi-PID 2 should be calibrated with a standard of that specific compound as span gas. The Multi-PID 2's 15 memory slots can be used to store calibration information for 15 different span gases.

The Multi-PID 2 will always detect all ionizable compounds present in a sample regardless of the response factor (RF) selected.

NOTE:
Even if the Multi-PID 2 has been calibrated with a specific compound, its response is not specific and the presence of another ionizable impurity may render the numerical result invalid.

It is often impractical to carry a range of different standards into the field. Approximate results can be obtained by calibrating the Multi-PID 2 with the recommended span gas and entering the appropriate response factor.
The response factor is based on the ratio of the response of the specific compound to the response of the span gas. The response factor multiplies the Multi-PID 2's reading, then displays and records it. See table 5 on page 97 for response factors. This list should be used only for concentrations up to 500 ppm of the specific compound, as response factors change with concentration.

WARNING:
The Multi-PID 2 is a total VOC instrument and will ALWAYS respond to all ionizable compounds present in a sample. The Multi-PID 2 will NEVER respond only to a specific compound if an RF is programmed. It is the responsibility of the user to be aware of the limitations of PID instruments

Response Factors and Memory Slots

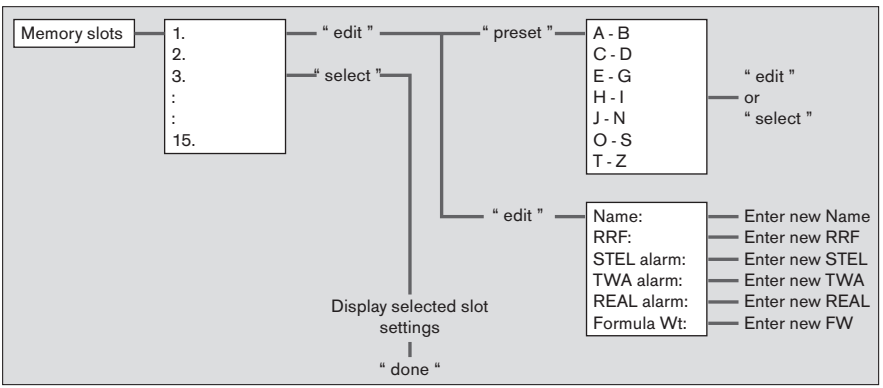


Figure 17 – Function Memory Slots Settings

Response factors built into the Multi-PID 2 are used to correct for the response of the PID to a specific compound. These correction factors are often called response factors (RF). The Multi-PID 2 has 15 memory slots. Each memory slot can store one preset RF. Library/RF selections simplify Memory Slot programming and provide standard response factors for approximately 100 compounds. The selection allows you to select an entry from a pre-programmed library. The name " **Name** ", response factor " **RRF** ", the three alert levels " **STEL** ", " **TWA** " and " **REAL** " and the formula " **FWt** " are all set from the library.

To select a preset to program the selected Memory Slot:

1. Press " **menu** ", then use the " ▼ " key to highlight " **Memory Slots** ", then press " **select** ".

To select a memory slot:

Press the " ▼ " key until the memory slot you wish to use is highlighted. Press the " **select** " key.
The name of the compound, RRF, STEL, TWA, REAL and FWt are displayed for a few seconds for this memory slot. Press " **done** " to return to the main menu.

To edit a memory slot:

1. Press " **menu** ", then use the " ▼ " key to highlight " **Memory Slots** ", then press " **select** ".
2. Use the " ▼ " key to select the memory slot, then press " **select** " to display the memory slot contents. Press " **done** " to return to the main menu.
   or
3. Use the " ▼ " key to select the memory slot, then press " **edit** " to change the values for RRF, STEL, TWA, REAL and FWt.
4. Press " **edit** ", then highlight either Name, RRF, STEL, TWA, REAL or FWt using the " ▼ " key, then press " **select** ".
5. Use the " ▲ " " ▼ " and " ▶ " keys to enter the desired number.
6. Highlight the " ✓ " checkmark, then press " **done** ".
7. Press the " **done** " key to return to the main display or press " **select** " to edit another value.
8. To return to the main menu, press " **select** ", then " **done** ".

To select a pre-programmed compound stored in the Multi-PID 2's Preset RRF library:

1. Press " **menu** ", then use the " ▼ " key to highlight " **Memory Slots** ", then press " **select** ".
2. Use the " ▼ " key to select the memory slot, then press " **edit** " to display the memory slot contents.
3. Press " **preset** ".
4. Use the " ▼ " key to choose the alpha range of the compound of interest, then press the " **select** " key.
6. Choose the compound of interest using the " ▼ " key and press the " **select** " key.
7. Press the " **back** " key to accept the choice or press " **edit** " to modify the preset values for RRF, STEL, TWA, REAL and FWt as shown above.

Data Log Options Menu

The " **Data Log Options** " function can be used for the following functions:
" **Clear data log** ", " **Edit interval** " (only in TVOC mode) and
" **Download to PC** " .

Clear Data Log

The " **Clear data log** " function clears all measurement values in the Multi-PID 2 memory.

NOTE:
Deleted information cannot be recovered. You should play back and print or download the contents of the datalogger before deleting any information.

To empty the data logger in the Multi-PID 2:

1. Press the " **menu** " key.
2. Use the " ▼ " key to choose **» Data Logger Options «**, and then press the " **select** " key.
3. Choose **» Clear data log «**, and then press the " **select** " key.
4. Press either the " **yes** " or " **no** " key in response to **» Are you sure you want to clear all data? «**.

Edit interval

Only available in TVOC mode.

1. Press the " **menu** " key.

Use the " ▼ " key to highlight " **Data Logger Options** ", then press " **select** ".

3. Highlight " **Clear data log** ", then press " **select** ".
4. Use the " ▲ " " ▼ " and " ▶ " keys to enter the desired sampling interval.
5. Highlight the " ✓ " checkmark, then press " **done** ".

Download to PC

The " **Download to PC** " function starts the download of data from the Multi-PID 2 onto the PC. The Multi-PID 2 computer cable, Part No. 83 17 667, must be connected between the Multi-PID 2 and the PC before beginning the data download. The Dräger GasVision software must be installed and running on the PC prior to download.

To download data:

1. Press the " **menu** " key.
2. Use the " ▼ "-key to choose **» Data Logger Options «** the press the " **select** " key.
3. Use the " ▼ " key to choose **» Download to PC «**, then press the " **select** " key.
4. Press the " **next** " key at the **» Connect Instrument to PC «** prompt.
5. The display will show **» Downloading Data «** and data will now download to the PC. Press the " **done** " key to stop the download at any time.

Clear values Menu

Only available in GAS mode.

The " **Clear values** " function can be used to clear the latest measurement values for the highest measured concentration (SMAX), the latest STEL value or all values (ALL) which are shown in the display.

1. Press " **menu** ", then use the " ▼ " key to highlight " **Clear values** ", then press " **select** ".
2. Selecting the values and pressing the " **clear** " key clear the highlighted values.

Edit Alarms Menu

Only available in GAS mode.
The " **Edit Alarms** " function can be used to edit the latest set alarm values for the STEL and the REAL alarm.

1. Press " **menu** ", then use the " ▼ " key to highlight " **Edit Alarms** ", then press " **select** ".
2. Use the " ▼ " key to highlight " **STEL alarm** " or " **REAL alarm** ", then press " **select** ".
3. Use the " ▲ " " ▼ " and " ▶ " keys to enter the desired value.
5. Highlight the " ✓ " checkmark, then press " **done** ".

Humidity Tube Menu

Only available in TVOC mode.
The " **Humidity Tube** " function can be used in combination with a PID pre-filter tube humidity (Order No. 81 03 531) to enhance the measuring performance by reducing the humidity.
This tube is used to measure the Total Volatile Organic Compounds value (TVOC) for 15 minutes (filter capacity of the tube at 40°C and 100 % relative humidity). Then you are asked to check the tube and to replace it, if necessary.

1. Press " **menu** ", then use the " ▼ " key to highlight " **Humidity Tube** ", then press " **select** ".

Routine Maintenance

Maintenance Intervals

The device should be calibrated before measuring, especially if it was not used for a longer period of time.

If used, the 11.7 eV lamp should be replaced approx. every six months.

Calibration Technical Description

Periodic calibration is required to compensate for the Multi-PID 2 output changes due to inlet filter restriction, ionization chamber contamination, lamp cleanliness, pump wear and other factors.

During calibration, the Multi-PID 2 is first exposed to zero air. A small (zero) signal is generated. This zero signal is stored by the microprocessor.

The Multi-PID 2 is next exposed to span gas. This span gas signal is stored by the microprocessor. The microprocessor subtracts the zero signal from the span gas signal and divides the difference by the user-entered span gas concentration. The resulting sensitivity is stored in the selected Memory Slots with the zero signal and the alarm levels. This number is then multiplied by the response factor and displayed.

The Multi-PID 2 readings are always relative to the calibration gas. After calibration with isobutylene, the Multi-PID 2 will respond directly in units equivalent to isobutylene. Most volatile organic compounds will be detected by the Multi-PID 2.
It cannot distinguish between isobutylene and other ionizable compounds. A reading of 10 ppm indicates all ionizable compounds that are present have generated an ion current proportional to 10 ppm of isobutylene. The reading is actually 10 ppm isobutylene equivalent units. The Multi-PID 2 readings give an indication of the total ionizables present and their concentration relative to the calibration gas.

Calibration Introduction

The Multi-PID 2 must be calibrated in order to display concentration in ppm units equivalent to the calibration gas. First, a supply of zero air, which contains no ionizable gases or vapors, is used to set the Multi-PID 2's zero point. Then, a calibration gas, containing a known concentration of a photoionizable gas or vapor, is used to set the sensitivity.

Clean indoor ambient air may be substituted for a cylinder of zero air. Due to the Multi-PID 2's sensitivity, outdoor air is usually unsuitable for calibration unless the activated charcoal filter (Part No. CH 24 101) and filter tube holder (Part No. 83 19 093) is used.

Commercially sourced zero air should not have more than 0.1 ppm total hydrocarbons (THC).

To determine the TLV of the compounds contained in the calibration gas, refer to the Material Safety Data Sheet (MSDS) supplied with your calibration gas cylinder.

NOTE:
Disconnect the Multi-PID 2 from the AC adapter before beginning calibration

Compressed Gases

Cylinders of compressed gas, such as calibration gas, must be handled with extreme care. For safety, the calibration gas cylinders must be secured before use.

Please observe the following handling procedures:

- Mark each new regulator with its intended gas service and never use a regulator for more than one service. To ensure safety and avoid contamination, regulators should be dedicated to one service. Do not change gas service or adapt equipment without consulting your gas supplier.
- Do not heat or expose cylinders or regulators to temperatures above 52 ^{o}C (125 ^{o}F). The cylinders may rupture at high temperatures.
- Use only the specified regulator for the calibration gas. Confirm regulator type and material with your specialty gas supplier.
- Always secure cylinders before removing the cylinder valve protection cap.
- Do not drag or roll cylinders. Large cylinders should only be moved on carts designed for compressed gas cylinders. Do not move cylinders without the valve protection cap in place.
- Wear safety glasses when working with compressed gases.
- Do not store cylinders in a hazardous location. Store cylinders in an upright position away from possible sources of heat or sparks.
- Never plug, obstruct or tamper with safety relief devices.

Regulators for Compressed Gases

When connecting a regulator to a large cylinder:

- Ensure cylinder valve and regulator connection match.
- Ensure regulator construction materials are compatible with the gas, and that the cylinder pressure gauge will withstand the cylinder pressure.
- Never use the regulator as a shut-off valve. Close the cylinder when it is not in use.
- Do not subject the regulator to an inlet pressure greater than recommended.
- Do not move or detach the regulator when it is pressurized or when it is in use.

- Before connection, ensure the gas cylinder valve and the regulator CGA connection are clean.
- Turn the pressure control valve on the cylinder all the way off (close the cylinder). Turn the regulator outlet to off. Open the gas cylinder valve slowly and check for leaks. Adjust the delivery pressure and then open the regulator outlet valve.

Calibration Gas

Adequate ventilation must be provided when the Multi-PID 2 is being calibrated.

If compound threshold limit values (TLV) are exceeded, you should use a gas bag for sampling and calibration.

To determine the TLV of the compounds contained in the calibration gas, refer to the Material Safety Data Sheet (MSDS) supplied with your calibration gas cylinder.

Calibration Using the Flow-Match Regulator

Connecting the Flow-Match Regulator to the Cylinder

WARNING:
Observe proper handling procedure for all gases!

To connect the flow-match regulator to the gas cylinder:

1. Connect the regulator to the calibration gas cylinder.
2. If you are using a portable tank of calibration gas (Part No. 68 10 687), connect the regulator (Part No. 68 10 688) directly to the tank.
3. When the regulator is connected properly, you can read the cylinder contents from the regulator gauge.
4. Connect the adapter tubing to the regulator.
5. Check if the Multi-PID 2 is sucking in the gas pressure free, e.g. by means of a T-piece; paying attention the fact that the flow from the gas cylinder is higher than the inlet flow of the Multi-PID 2.

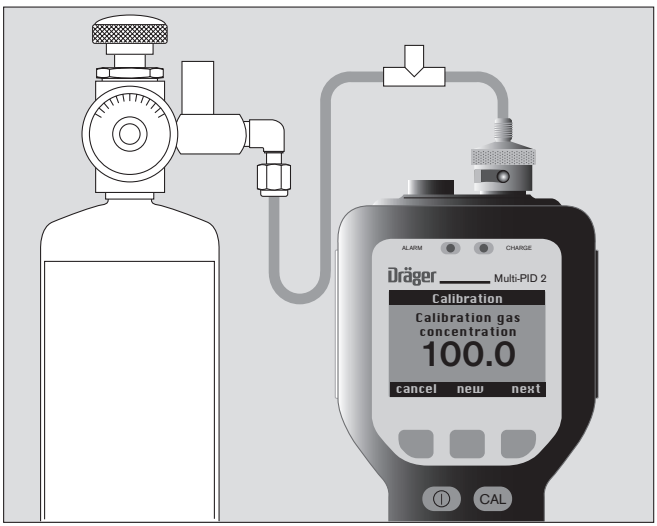


Figure 18 – Calibration with Flow-Math

Calibrating the Multi-PID 2 with the Flow-Match Regulator

1. Ensure that the short sample probe is connected to the Multi-PID 2 inlet. If you are using the long probe for sampling, then ensure the long probe is connected to the Multi-PID 2.

NOTE:
Ensure the sample probe is free of any contamination, as this will affect the calibration.

2. Press the (CAL)-key.
3. Follow the instructions on the display and either connect the Multi-PID 2 to zero air, connect the optional activated charcoal filter (Part No. CH 24 101) and filter tube holder (Part No. 83 19 093), or leave the instrument unconnected so it can sample clean ambient air. Then press the **" next "** key. The Multi-PID 2 will take 60-90 seconds to set the zero point for calibration.
4. The Multi-PID 2 display will show **» Zero air calibrated. Continue calibration? «** Press the **" next "** key.
5. Enter the span gas concentration if the concentration displayed on the Multi-PID 2 is different than the concentration of the span gas cylinder. Press the **" new "** key and follow the display prompts. For further information, see page 36 for numeric value, duration, time, and date entry. If the span concentration matches the span gas cylinder concentration, press the **" next "** key. To exit calibration, press the **" cancel "** key.
6. Ensure the calibration gas cylinder is upright and open the regulator by turning the valve counter clockwise. Open the regulator until the ball is 1/8" from its rest position.
7. Connect the span gas to the Multi-PID 2 (if the zero air calibration was done with either a Zero Air cylinder or the optional activated charcoal tube and tube holder, either should be disconnected before connecting the span gas fitting to the Multi-PID 2).
8. The Multi-PID 2 will take 60-90 seconds to set the span set point. When finished with the calibration, the Multi-PID 2 will display **» Calibration complete «**.

NOTE:
If you are not using the Dräger Safety Flow-Match Regulator, ensure that the inlet pressure is less than 0.35 bar (5 psi) when calibrating.

NOTE:
While the Cal status is active, all alarms are deactivated.

Battery Charging

A fully charged battery pack powers the Multi-PID 2 for approximately 8 hours. If the instrument is to be used for more than 8 hours, carry a spare battery pack (Part No. 83 17 670). When the first one has been discharged, replace it with the spare.

NOTE:
If you do not turn the Multi-PID 2 off before removing the battery pack, you will reset the instrument and you will lose all logged data and setup parameters.

When the Multi-PID 2 displays the low battery symbol, the battery pack requires charging. When the low battery symbol is displayed, you have 30 minutes of operation left. The Multi-PID 2 will turn itself off before the battery pack becomes critically low.

WARNING:
Do not remove or recharge the battery pack in a hazardous location.

Upon return from field work, charge the battery packs as outlined in Battery Charging on page 26. Use only the AC adapter specified for use with the Multi-PID 2. Optionally you can use the off-line charger to charge the battery pack independently of the instrument. See Off-Line Charger on page 50.

NOTE:
You must use the 220 V battery charger (Part No. 83 17 661) in order to comply with the requirements of the applicable Council Directives.

If you do not require portable operation, you can use the Multi-PID 2 while it is connected to the AC adapter.

WARNING:
The Multi-PID 2 is not intrinsically safe when connected to an AC adapter.

The AC adapter automatically charges at a high charge rate until the battery pack is fully charged. It then maintains the full charge with a low continuous charge rate indefinitely so there is no danger of overcharging.

When the Charge LED on the top of the Multi-PID 2 is red, the battery is charging. When the Charge LED turns green, the battery is fully charged.

Battery Pack Care

Leaving the Multi-PID 2 for more than 3 months without charging the batteries may result in the loss of recorded data and setup parameters. If the Multi-PID 2 is not used for long periods of time, recharge the battery for a few hours every 30 days to avoid loss of data. See Battery Charging on page 26 for instructions on charging the battery.

Please observe the following:

- For replacement battery pack use only Part No. 83 17 670.
- Do not dispose of the battery pack in a fire. The cell may explode.
- The battery pack is 24% cadmium (Cd) by weight. This battery pack must be disposed of properly. Check with local codes for special disposal instructions.
- Do not open or mutilate the battery pack.
- Exercise care in handling battery packs in order not to short the terminals with conducting materials such as rings, bracelets and keys. The battery or conductor may overheat and cause burns.
- Charge the battery pack using the AC adapter provided with or identified for use with this product only in accordance with the instructions and limitations specified in this manual. For AC adapter use only Part No. 64 05 428 (North America) or Part No. 83 17 661 (Europe).

Maintenance of the UV Lamp

Removing and Replacing the UV Lamp

NOTE:
Do not remove or replace the UV lamp in a hazardous location.

To remove the UV lamp from your instrument:

1. Ensure the instrument is turned off.

WARNING:
You must turn the instrument off before removing the lamp cover.

2. Remove the lamp housing cover.
3. Tilt the Multi-PID 2 slightly and remove the UV lamp.

WARNING:
Do not touch the wire grid inside the detector cell. Any dust or dirt in the detector cell can be blown out with a gentle jet of compressed air.

Do not insert any object, other than the UV lamp, into the lamp holder.

4. Without touching the lamp window, place the new lamp into the Multi-PID 2 lamp holder, window first. See Figure 19.

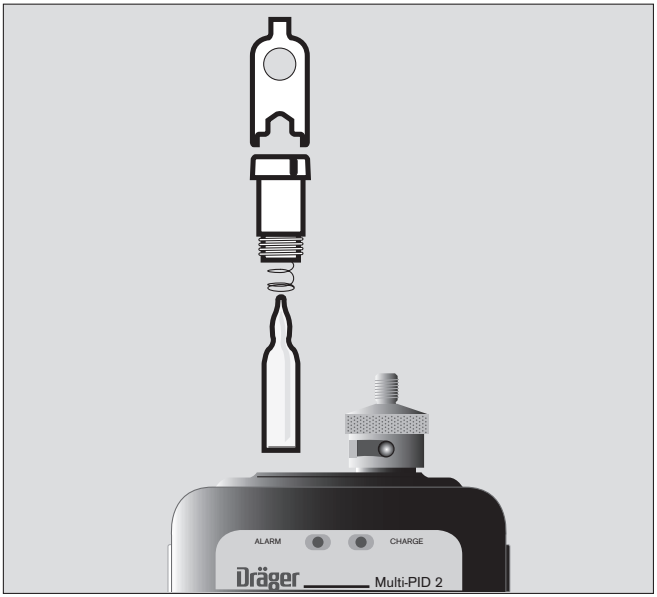


Figure 19 – Removing the UV Lamp

NOTE:
Do not force the lamp into the lamp holder.

5. Replace the lamp housing cover. Tighten the cover down. Do not over tighten.
6. Calibrate the Multi-PID 2 and then continue normal operation.

Cleaning the UV Lamp Window

During the course of normal operation, a film builds up on the window of the UV lamp. The rate at which the film develops depends on the type and concentration of the gases and vapors being sampled and results from the UV light interacting with them.

Hot gases and vapors may contribute to a decrease in sensitivity because they may condense on the lamp window. Condensation may eventually evaporate off the window, but it will usually leave a residue that must be removed by cleaning the lamp window.

Since some UV inhibiting deposits are invisible to the eye, regular cleaning of the lamp window is strongly recommended. Clean the lamp frequently to prevent a heavy buildup of deposits that may be difficult to remove.

WARNING:
Do not remove the UV lamp in a hazardous location.

The UV lamp cleaning kit (Part No. 83 18 318) includes aluminum oxide powder (3.0-micron powder) and cotton swabs. Additionally, you will require approximately 10 mL of methanol. When ordering methanol, specify purge and trap grade.
The instructions provided below are for 10.6 eV lamps. Refer to Cleaning the Lithium Fluoride Window for special instructions to clean the 11.7 eV lamp window.

WARNING:
Never touch the UV lamp window with your fingers.

To clean the UV lamp:

1. Remove the lamp as outlined in Removing and Replacing the UV Lamp on page 80.
2. Allow the lamp to cool to room temperature to avoid thermal shock, which could crack the window.
3. Dampen a cotton swab in methanol and dab it into the cleaning compound. Allow a small amount of the cleaning compound to adhere to the cotton tip.

WARNING:
Do not use methanol to clean the 11.7 eV lamp window.

4. Using small circular motions, rub the cleaning compound onto the lamp window. Do not exert excessive force onto the window, since the window can be permanently damaged by misuse.
5. Continue cleaning for approximately one minute.
6. Dampen a new cotton swab with methanol and remove any trace amounts of the cleaning compound from the lamp window.
7. Wipe the window and the lamp with a dry, lint free tissue to remove any trace amounts of the cleaning compound and methanol. All traces of cleaning compound must be removed.
8. If you removed an O-ring from the lamp, replace it now. Ensure your hands are clean and dry.
9. Without touching the lamp window, replace the lamp as outlined in Removing and Replacing the UV Lamp on page 80.

Cleaning the Lithium Fluoride Window

To clean the 11.7 eV lamp window:

1. Clean the lamp window with dry aluminum oxide powder on a dry cotton swab. Do not use methanol or water.
2. Wipe the window and the lamp with a dry, lint free tissue to remove any trace amounts of the cleaning compound and methanol. All traces of cleaning compound must be removed.
3. The lamp window can also be regenerated by storing the lamp in a desiccant for at least 5 days.

NOTE:
You may not be able to fully clean the 11.7 eV lamp window.

Replacing the Sample Inlet Filter

The Multi-PID 2 is equipped with a combined dust and water filter to reduce detector contamination. As the filter collects dust, the Multi-PID 2's inlet flow rate and sensitivity decrease. The filter will not allow water to pass through, but the filter will not stop all solvents.

NOTE:
Do not aspirate liquid samples with the Multi-PID 2!

Replace the filter on a weekly basis, or more frequently if the Multi-PID 2 is used in a dusty or wet environment. You must replace the filter if the Multi-PID 2 has been exposed to water. If you are sampling hot gases or vapors, condensation in the sample line may also affect the filter.

WARNING:
Do not replace the inlet filter in a hazardous location.

To replace the inlet filter:

1. Turn the instrument off. Unscrew the filter housing from the detector housing. Be careful not to lose the O-ring seal.
2. Remove the Teflon/Polypropylene filter and install the new filter (Part No. 83 17 681). Place the filter so that the Teflon side is facing down in the filter housing and the mesh side is facing the Multi-PID 2.
   Handle the filter disk only by the edges. The mesh may be damaged or contaminated by excessive handling. Use forceps if possible.
3. Replace the filter housing.
4. Recalibrate and then continue normal operation.

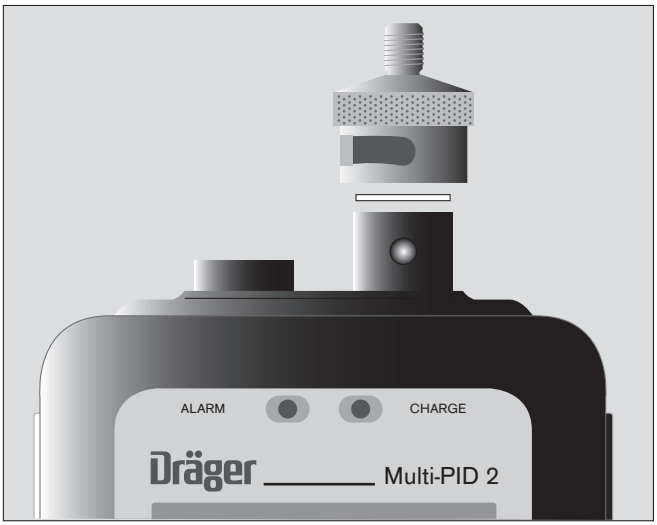
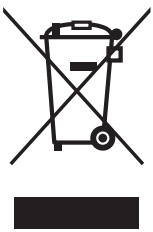


Figure 20 – Replacing the Inlet Filter

Waste electrical and electronic equipment



EU-wide regulations for the disposal of electric and electronic appliances which have been defined in the EU Directive 2002/96/EC and in national laws are effective from August 2005 and apply to this device.
Common household appliances can be disposed of using special collecting and recycling facilities. However, as this device has not been registered for household usage, it must not be disposed of through these means. The device can be returned to your national Dräger Safety Sales Organization for disposal. Please do not hesitate to contact the above if you have any further questions on this issue.

Troubleshooting

General Information

If you have a service-related question about the Multi-PID 2, consult this manual first. If you cannot find the answer in this documentation, contact Dräger Safety's Technical Support Department.

When you call, please have the following information ready:

1. A description of what happened and what you were doing when the problem occurred.
2. Any corrective action that you have tried.
3. The exact wording of any messages that appeared on the display.

WARNING:
Do not service the Multi-PID 2 in a hazardous location.

Troubleshooting

Situation	Cause	Action
Zero Air Error	Contamination of sample lines, sample probe, inlet filter or fittings before the detector	Clean or replace contaminated item
	Span gas and zero air are mixed up.	Ensure that clean air is used to zero the Multi-PID 2s.
	Ambient air is contaminated.	If you are not sure of the cleanliness of the ambient air, use a commercial zero grade air to zero the Multi-PID 2.
Span Gas Error	Span gas and zero air are mixed up.	Ensure that clean air is used to zero the Multi-PID 2.
	Span gas concentration is too low.	Span gas concentration should be higher than 25 ppm.
	UV lamp window is dirty.	Clean the lamp window. See page 82.
	UV lamp is failing.	Install a new lamp. See Removing and Replacing the UV Lamp on page 80.
	The concentration and sample gas are not com-patible with the Multi_PID 2.	Contact Dräger Safety.
UV Lamp Error	UV lamp has not started immediately.	This fault may occur momentarily when the Multi-PID 2 is first turned on. Allow 60 seconds for UV lamp to start and fault to clear.
		Turn the Multi-PID 2 off then on again. Wait 60 seconds for UV lamp to start.
	UV lamp is not installed	Install UV lamp. See Removing and Replacing the UV Lamp on page 80
	Incorrect lamp is installed.	Use only a getterless UV lamp. 83 18 307 or 83 18 317.
	Electronic problem	Contact Dräger Safety for assistance.

Situation	Cause	Action
Pump Error	If the pump sounds labored, the pump is operating outside its normal operating range.	Check for obstructions in the sample line. Verify that the sample line, sample probe and inlet filter are not blocked.
		Ensure that the sample outlet is not blocked.
	The Multi-PID 2 has aspirated a liquid.	Contact Dräger Safety.
	The pump has failed.	Contact Dräger Safety.
Blocked Filter		Replace the inlet filter Dräger Safety Part No. 83 17 681.
Instrument over range	High concentrations of gases will saturate the detector and electronics.	Wait until the display returns to normal. PIDs are designed to detect relatively low levels of gases.
	The detector has become saturated.	Move the Multi-PID 2 to a location where it can sample clean air. Sample clean air until the readings stabilize at a low level.
	Detector has been short-circuited by foreign matter in the cell.	Contact Dräger Safety.

General Questions

Fault	Possible Cause	Remedy
Very low or no instrument response detected, yet compounds are known to be present	The Multi-PID 2 has not been properl	Verify the concentration of the span gas. Calibrate the Multi-PID 2. See page 73.
	Memory slots are not set up correctly.	Program the memory slots. See page 66.
	Response Factor has been set to zero.	Set Response Factor to 1.0 or refer to Table 6 for correct response factor.
	Detector is leaking.	Ensure the UV lamp is correctly installed.
		Ensure the lamp cover is tight. Do not over tighten.
		Ensure the O-ring seal on the lamp cover is positioned correctly.
	UV lamp is the incorrect size.	Contact Dräger Safety for correct lamp.
	Sampling environment is extremely humid or it is raining.	Water vapor is not ionized by the PID. Water vapor does scatter and absorb light that causes a higher or lower reading. The Multi-PID 2 has been designed to work in a humid environment but you may notice a decreased response.
	UV lamp is failing.	Install a new UV lamp. See page 80.
	High concentrations of non-ionizable compounds.	Chemical compounds with an ionization potential higher than 10.6 eV or 11.7 eV scatter and absorb UV light. Sensitivity may be decreased. Contact Dräger Safety for more information.

Fault	Possible Cause	Remedy
Erroneous high readings	Sampling environment is very humid.	Water vapor may contain mineral salts which carry a charge. The water vapor becomes an electrolytic solution which becomes ionized when it enters the detector.
	The Multi-PID 2 is not properly calibrated.	Ensure that the calibration gas is the correct concentration and calibrate the Multi-PID 2 as described on page 74.
	Memory Slots have not been properly programmed.	Program the memory slots. See page 66.
	Detector has been short-circuited by foreign material.	Contact Dräger Safety.
Date and time setting are not retained	The battery pack was removed before the Multi-PID 2 was turned off.	Replace the battery pack and reset the time and date. See page 26.
	The Multi-PID 2 has not been used for 3 months or more.	Connect the Multi-PID 2 to the battery charger and recharge the battery. Reset the date and time.
Display is blank	Battery pack is critically low.	Recharge or replace the battery pack.
	The battery pack is not connected to the Multi-PID 2 properly.	Ensure the battery pack connector is securely attached to the Multi-PID 2.
Sample flow is less than 300 ml/min/	Inlet filter is plugged.	Replace the inlet filter. See page 84.
	Inlet filter is incorrectly installed.	Ensure the inlet filter is installed correctly. See page 84.
	Sample outlet is blocked.	Clear blockage from sample outlet.
	Pump has been damaged.	Contact Dräger Safety.
Liquid has been aspirated.	The Multi-PID 2 has been exposed to a solvent that can pass through the inlet filter.	Contact Dräger Safety.
Very corrosive gases have been sampled.		Contact Dräger Safety.
Cannot download data or communicate with PC.	Cable is not connected	Connect the Multi-PID 2 to the PC. See page 24.

Appendices

Specification

Size:	9” (230 mm) long x 3” (80 mm) deep x 4.25” (110 mm) wide at display tapering to 2.6” (67 mm) at handle
Weight:	1.9 pounds (0.86 kg)
Detector:	Instant on photoionization detector with standard 10.6eV UV lamp, optional 11.7 eV lamp available
Keypad:	5 keys with tactile feedback
Display:	8 line LCD display for alphanumeric readouts and soft key display
Datalogger memory:	200 hours at 1 minute sample interval
Serial output:	RS-232, 9600 baud, 8 data bits with no parity, for connection to a Windows™ compatible computer
Audio output:	85 decibels on Alarm
Inlet connection:	1/8” (3.175 mm) fitting
Battery type:	Nickel cadmium rechargeable cell with intelligent charger. The battery pack is 24% cadmium (Cd) by weight.
Charge/discharge time:	4 hr/8 hr
Input Power:	12 VDC, 1.0 A
Battery charger:	Automatically charges and maintains full charge in battery pack.
U.S. and Canada – Part No. 64 05 428	
Input	120 VAC, 60 Hz, 21 W
Output	+12 VDC 1000 mA
Regulatory Approvals:	CSA, UL
All other Countries – Part No. 83 17 660	
Input	100-250 VAC, 50-60 Hz, 0.5-0.3 A
Output	+12 VDC 2.08 A
Regulatory Approvals:	ATEX, UL

Materials in sample stream:	Stainless steel, Teflon, Viton®, polypropylene, nitrile-chorobutadiene rubber, nickel.
Inlet filter:	Replaceable Teflon/Polypropylene, 1 µm
Inlet flow rate:	Greater than 300 mL/min
Operating temperature range:	0 to 50 °C (32 to 122 °F)
I/S Certified Temperature Range:	0 to 40 °C (32 to 105 °F)
Operating humidity range:	0 to 95% relative humidity (non-condensing)
Operating humidity range with optional humidity pre-filter tube:	0 to 100% relative humidity (non-condensing)
Operating altitude range:	Up to 10,000 ft (3000 m)
Storage temperature range:	–10 to 65 °C (14 to 149 °F)
Storage humidity range:	0 to 100% relative humidity (non-condensing)
Storage altitude range:	Up to 15,000 ft (4570 m)
Operating concentration range:	0.1 to 10,000 ppm, isobutylene
Accuracy:	+/–10% or +/–2 ppm, whichever is greater
Precision:	1% of calibration (calibrated with 100 ppm isobutylene)
Response time:	Less than 3 seconds to 90%
Detection limit:	0.1 ppm isobutylene
Dilution probe:	Normal calibration: concentrations between 100 to 20,000 ppm +/– 20% High accuracy calibration: concentrations between 100 to 1000 ppm +/– 15%. Concentrations between 1000 to 20,000 ppm +/– 20%

NOTE:
Specifications subject to change without notice.

Installing Alternate AC Plug on the Battery Charger

In most cases the Multi-PID 2 will be shipped with an AC line cord that will fit the AC wall outlet in your area. If this cannot be done, you may need to obtain an AC line cord suitable for the AC receptacle in your area.
The AC line cord, attached plug and receptacle must be marked with your country's certification mark and the cord must have a Harmonization (HAR) mark.
The line cord must be rated for either 100 to 120 VAC at 60 Hz or 220 to 240 VAC at 50 Hz. The voltage rating will depend on the voltage in your area.

Contact your Dräger Safety representative to obtain more information.

Calibration Gas Supplier

The recommended span gas is isobutylene in air. 100 ppm isobutylene in air may be obtained from Dräger Safety.

The exact concentration will be determined by your application. Other concentrations and other gases may be obtained from your local gas supplier. If you cannot locate a local gas supplier, contact Dräger Safety's Technical Support Department.

Presets and Response Factors

Presets simplify Memory Slot programming, and provide standard response factors and alarm levels for approximately 100 compounds. The name, response factor and three alarm levels are all set from the preset.

You can change any of the values entered in the Memory Slots. Changes made to the library information that has been loaded into a Preset will have no effect on the original library entry.

The response factors were determined over the range 5 - 500 ppm, based on a 100-ppm isobutylene calibration. Isobutylene RF = 1.0. The following formula is used for calculation of response factors:

$$\text{Response Factor} = \frac{\text{Actual Concentration}}{\text{Multi-PID 2 Response}}$$

A response factor less than 1.0 indicates a compound response better than that of isobutylene. A response factor greater than 1.0 indicates a lower response than that of isobutylene.

NOTE:
It does not matter which response factor is entered. The Multi-PID 2's response is not specific to any one compound. The displayed reading represents the total concentration of all ionizable compounds in the sample.

Table 5 – Response Factors

Compound	Response Factor
Acetaldehyde	10.5
Acetone	1.2
Acetophenone	2.0
Acrolein (2-Propenal)	4.0
Acrylic Acid	10.9
Acrylonitrile	ND [3)]
Allyl Chloride (3-Chloro-1-Propene)	3.9
Benzene	0.5
Bromoform (Tribromomethane)	2.0
1,3-Butadiene	0.7
n-Butane	0.2
n-Butanol	3.4

Compound	Response Factor
n-Butyl Acetate	2.3
Butyl Acrylate	1.8
Butyl Cellosolve	3.1
n-Butyl Acrylate	1.8
n-Butyl Mercaptan (Butanthiol)	0.6
Carbon Disulfide	1.3
Chlorobenzene	0.4
Crotonaldehyde (2-Butenal)	1.2
Cumene (Isopropylbenzene)	0.6
Cyclohexane	1.3
Cyclohexanol	3.4
Cyclohexanone	0.9
Diacetone alcohol	1.8
1,2-Dichlorobenzene (ortho-)	0.5
cis-1,2-Dichloroethylene	0.8
trans-1,2-Dichloroethylene	0.4
N,N-Dimethylformamide (DMF)	0.8
1,4-Dioxane	1.3
Epichlorohydrin	6.5
Ethanol	8.8
Ethyl Acetate	3.8
Ethyl Acrylate	2.3
Ethylbenzene	0.5
Ethyl Cellosolve (2-Ethoxyethanol)	1.3
Ethylene Glykol	0.1
Ethyl Ether (Diethyl Ether)	1.2
Ethyl Mercaptan (Ethanethiol)	0.6
Ethylene	10.1
n-Heptane	2.4
n-Hexane	4.7
2-Heptanone	2.1
Hydrogen Sulfide	3.3

Compound	Response Factor
Isoamyl Acetate	1.8
Isobutyl Acetate	2.6
Isobutyl Alcohol	0.3
Isobutyraldehyde	1.1
Isopentane	8.2
Isoprene (2-Methyl-1,3-Butadiene)	0.6
Isopropanol	4.4
Isopropyl Acetate	2.6
Isopropyl Ether	0.8
Mercaptopropionic Acid	0.1
Methacrylic Acid	000 [4)]
Methyl n-Amyl Ketone (2-heptanone)	2.1
Methyl Bromide (Bromomethane)	1.6
Methyl Chloroform (1,1,1 – TCA)	000 [4)]
Methylene Chloride	000 [4)]
Methyl Ethyl Ketone (2-Butanone)	0.8
Methyl Isobutyl Ketone	1.0
Methyl Mercaptan	0.5
Methyl Methacrylate	1.4
Methyl tert-Butyl Ether (MTBE)	0.8
Monomethylamine	1.3
n-Nonane	1.4
iso-Octane (2,2,4-Trimethylpentane)	1.2
n-Pentane	10.4
Polypropylene	0.8
Propane	000 [4)]
n-Propanol	5.1
Propionaldehyde (Propanal)	14.8
n-Propyl Acetate	3.1
Propylene	1.2
Propylene Oxide	5.8
Styrene	0.4

Compound	Response Factor
Syltherm XLT	9.8
Tetrachloroethylene (Perchloroethylene)	0.5
Tetrahydrofuran	1.5
Therminol	000 [4]
Toluene	0.5
1,1,1 – Trichloroethane	000 [4]
Triethanolamine	ND [3]
Trichloroethylene (TCE)	0.5
Trimethylamine	0.9
1,2,4 – Trimethyl Benzene	2.3
1.3.5 – Trimethyl Benzen	1.7
Vinyl Acetate	1.2
Vinyl Bromide	0.4
Vinyl Chloride (Chloroethylene)	1.7
Vinylidene Chloride (1,1-DCE)	0.8
meta –Xylene	0.5
ortho –Xylene	0.5
para-Xylene	0.5

Table 6 – Library Entries

Compound	Code	RF
Acetaldehyde	ACETAL	10.5
Acetone	ACETONE	1.2
Acrolein (2-Propenal) [5]	ACROLEIN	4.0
Allyl Chloride (3-Chloro-1-Propene) [5]	ALLCHLOR	3.9
Benzene	BENZENE	0.5
Bromoform (Tribromomethane) [5]	BROMFORM	2.0
1,3-Butadiene	13BUTADI	0.7
n-Butanol	nBUTANOL	3.4

Compound	Code	RF
n-Butyl Acetate	nBUTACET	2.3
n-Butyl Acrylate	nBUTACRY	1.8
n-Butyl Mercaptan (Butanethiol) [6]	nBUTMERC	0.6
Carbon Disulfide	CS2	1.3
Chlorobenzene	CHLOBENZ	0.4
Crotonaldehyde (2-Butenal)	CROTONAL	1.2
Cumene (Isopropylbenzene)	CUMENE	0.6
Cyclohexane	CYCHEXAN	1.3
Cyclohexanone	CYCHEXON	0.9
1,2-Dichlorobenzene (ortho-)	12DCBENZ	0.5
cis-1,2-Dichloroethylene	cis12DCE	0.8
trans-1,2-Dichloroethylene	trn12DCE	0.4
N,N-Dimethylformamide (DMF)	N,N-DMF	0.8
1,4-Dioxane	DIOXANE	1.3
Epichlorohydrin [5]	EPICLHYD	6.5
Ethanol	ETHANOL	8.8
Ethyl Acetate	ETHYACET	3.8
Ethyl Acrylate	ETHYACRY	2.3
Ethylbenzene	ETBENZEN	0.5
Ethyl Cellosolve (2-Ethoxyethanol)	ETHCELLO	1.3
Ethyl Ether (Diethyl Ether)	ETHETHER	1.2
Ethyl Mercaptan (Ethanethiol) [6]	ETHMERC	0.6
Ethylene [7]	ETHYLENE	10.1
n-Heptane	nHEPTANE	2.4
n-Hexane	nHEXANE	4.7
Hydrogen Sulfide	H2S	3.3
Isoamyl Acetate	IAMYACET	1.8
Isobutyl Acetate	IBUTACET	2.6
Isobutyraldehyde [6]	IBUTALDE	1.1
Isopentane	IPENTANE	8.2
Isoprene (2-Methyl-1,3-Butadiene) [8]	ISOPRENE	0.6
Isopropanol	IPA	4.4

Compound	Code	RF
Isopropyl Acetate	IPACETAT	2.6
Isopropyl Ether	IPROPETH	0.8
Methyl Bromide (Bromomethane)	MeBROM	1.6
Methyl Ethyl Ketone	MEK	0.8
Methyl Isobutyl Ketone	MIBK	1.0
Methyl Mercaptan (Methanethiol) [6)]	METHMERC	0.5
Methyl Methacrylate	MeMeACRY	1.4
Methyl tert-Butyl Ether (MTBE)	MTBE	0.8
Monomethylamine	MMeAMINE	1.3
n-Nonane	nNONANE	1.4
Iso-Octane (2,2,4-Trimethylpentane)	IOCTANE	1.2
n-Pentane	nPENTANE	10.4
n-Propanol	nPA	5.1
Propionaldehyde (Propanal) [5)]	PROPANAL	14.8
n-Propyl Acetate	nPROACET	3.1
Propylene [7)]	PROPYLEN	1.2
Propylene Oxide	PROPOXID	5.8
Styrene	STYRENE	0.4
Tetrachloroethylene (PCE)	PCE	0.5
Tetrahydrofuran	THF	1.5
Toluene	TOLUENE	0.5
Trichloroethylene	TCE	0.5
Trimethylamine	TRMeAMIN	0.9
Vinyl Acetate	VINACET	1.2
Vinyl Bromide	VINBROM	0.4
Vinyl Chloride (Chloroethylene)	VINCHLOR	1.7
Vinylidene Chloride (1,1-DCE)	1,1-DCE	0.8
meta –Xylene	mXYLENE	0.5
ortho –Xylene	oXYLENE	0.5
para-Xylene	pXYLENE	0.5

NOTES:

1. **Peak alarm levels have been established as the TLV-Ceiling concentration, or the TLV-STEL concentration in those cases where no TLV-Ceiling value exists.**
2. **In those cases where no STEL exists for a compound, the STEL value has been established as equivalent to the TWA value**
3. **Compound is Not Detectable (ND) by the Multi-PID 2. Please contact Dräger Safety Applications Department for further details.**
4. **Response factor for this compound using the 10.6 eV lamp is equal to 0.00 because the 11.7 eV lamp is required to ionize and detect this compound. Please contact Dräger Safety Applications Department for further details.**
5. **In cases where recommended exposure limits are below the detection limit for the compound in question, the estimated lower limit of detection has been substituted for those values.**
6. **The Multi-PID 2 is not suitable for monitoring these compounds at ACGIH recommended levels.**
7. **A 1000-ppm TWA has been established for those compounds which are "Simple Asphyxiants" and for which no exposure value exists.**
8. **For those compounds, which lack established exposure levels, an arbitrary value of 200 ppm has been established for the TWA, STEL and PEAK alarms.**

Reference

1. Maslansky, Carol J. and Steven P. Maslansky. Air Monitoring Instrumentation. New York: Van Nostrand Reinhold, 1993.
2. American Conference of Governmental Industrial Hygienists. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (1994-1995). Reprinted with permission.

NOTE:
The TLV/BEI™ publication is revised annually.

3. National Institute for Occupational Safety and Health (NIOSH). Recommendations for Occupational Safety and Health, Compendium of Policy Documents and Statements, January 1992.

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